Scheduling

The Graduate School

University of Rhode Island

BULLETIN

1994-1995

The Graduate School

University of Rhode Island

B U L L E T I N

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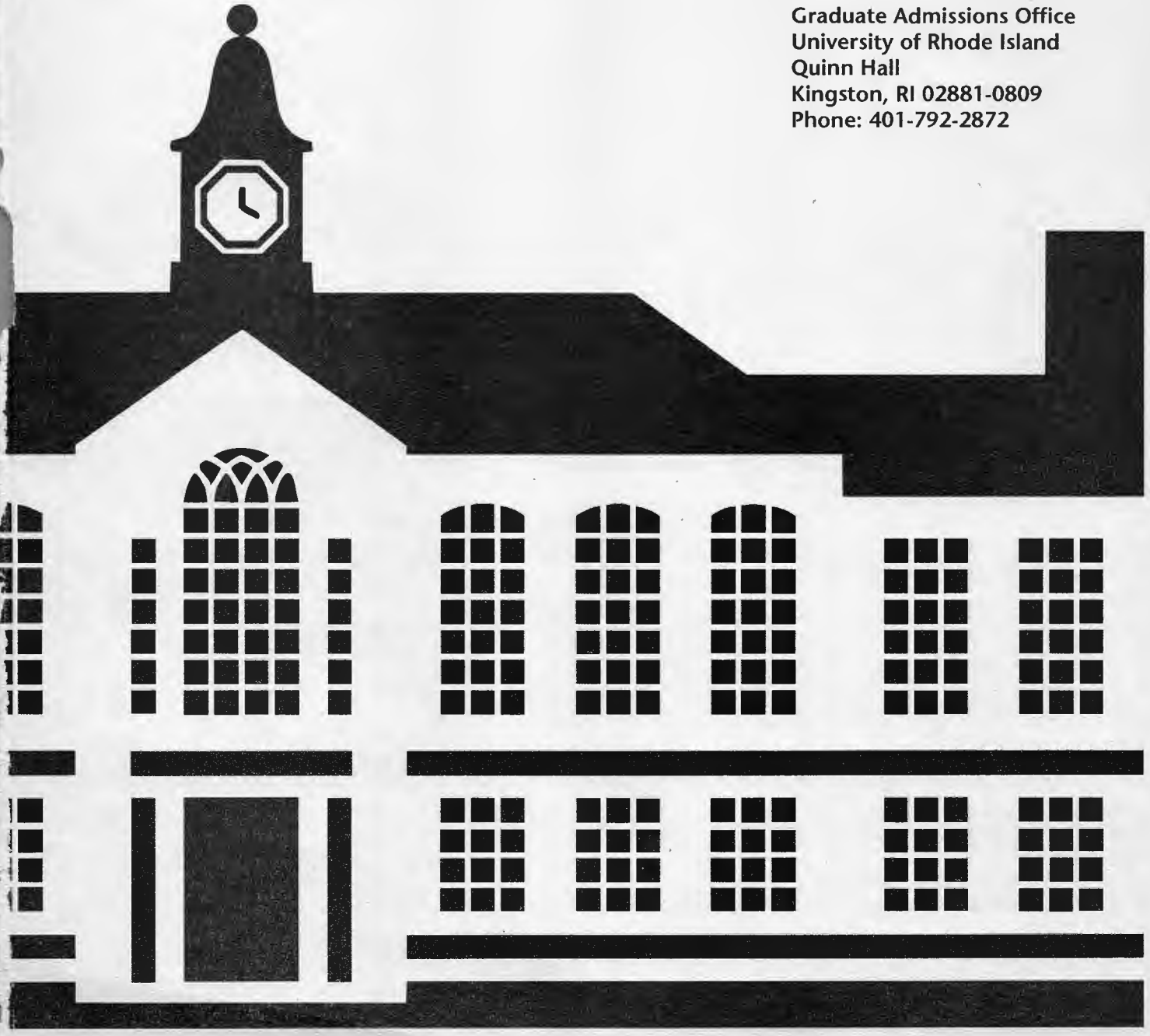

CALENDAR

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Fall Semester 1994

August 29–September 2
Registration week. Deadline for international students to arrive on campus.

September 5, Monday
Holiday, Labor Day.

September 8, Thursday
Classes begin, Kingston Campus and College of Continuing Education (CCE). University Faculty meeting, 3:30 p.m.

September 21, Wednesday
Final date to add courses, and for P–F option or audit requests. *Fees will not be adjusted downward for courses dropped after this date.*

October 7, Friday
Final date for nominations for January graduation.

October 10, Monday
Holiday, Columbus Day. Classes will not meet.

October 11–14
Currently enrolled matriculating graduate students may pick up advance registration materials for spring 1995 from the Office of the Registrar.

October 17–November 23
Currently enrolled matriculating graduate students may register for spring 1995 by telephone anytime after their earliest time to register.

October 25, Tuesday
Midsemester. Final date to drop courses and to change from P–F option to grade.

November 15, Tuesday
Deadline for applications for spring 1995, except for programs with earlier deadlines.

November 24, Thursday
Thanksgiving recess begins, 8 a.m.

November 28, Monday
Classes resume, 8 a.m.

December 14, Wednesday
Programs of study due for students admitted for fall 1994. Classes end, Kingston Campus.

December 15, 17–18
Reading days, Kingston Campus.

December 16, Friday
Final date for January candidates to submit completed master's and doctoral theses in a form acceptable for examination purposes along with the request for oral defense of thesis. NO EXTENSIONS OF TIME WILL BE GRANTED. *Theses must be submitted at least 20 calendar days prior to the date requested for oral defense. Selection of date should allow sufficient time for necessary revisions and retyping before submission in final form. See deadline below and note at the end of this calendar regarding scheduling examinations during the winter intercession.*

December 16, 19–23
Final examinations, Kingston Campus.

December 17, Saturday
CCE classes and examinations end.

December 26, Monday
Offices closed.

December 27, Tuesday
Final grades due in the Office of the Registrar by 4 p.m.

Spring Semester 1995

January 9–13
Registration week.

January 12, Thursday
Final date for January degree candidates to submit, in final form, master's and doctoral theses which have been successfully defended. NO EXTENSIONS OF TIME WILL BE GRANTED.

January 16, Monday
Holiday, Martin Luther King.

January 18, Wednesday
Classes begin, Kingston Campus and CCE.

January 31, Tuesday
Final date to add courses, and for P–F option or audit requests. *Fees will not be adjusted downward for courses dropped after this date.*

February 1, Wednesday
Final date for completion of admissions applications from individuals seeking financial aid for 1995. Applications for financial aid received subsequent to this date cannot be assured of full consideration.

February 15, Wednesday
Final date for nominations from departments and applications for fellowships and scholarships.

February 17, Wednesday
Final date for nominations for May graduation and for submission of annual review of doctoral candidates.

February 20, Monday
Classes will not meet.

February 22, Wednesday
Monday classes meet.

March 7, Tuesday
Midsemester. Final date to drop courses and change from P–F option to grade.

March 13, Monday
Spring recess begins, 8 a.m.

March 20, Monday
Classes resume, 8 a.m.

April 7, Friday
Final date for May degree candidates to submit completed master's and doctoral theses in a form acceptable for examination purposes, along with the request for oral defense of thesis. NO EXTENSIONS OF TIME WILL BE GRANTED. *Theses must be submitted at least 20 calendar days prior to the date requested for the oral defense. Selection of date should allow sufficient time for necessary revisions and retyping before submission in final form. See deadline below.*

April 15, Friday
Application deadline for summer 1995 admissions, except for programs with earlier deadlines.

May 3, Wednesday
Classes end, Kingston Campus. Programs of study due for students admitted in January 1995.

May 4, 6–7
Reading days, Kingston Campus.

May 5, 8–12
Final examinations, Kingston Campus.

May 8, Monday
Final date for all May degree candidates to submit, in final form, master's and doctoral theses which have been successfully defended. NO EXTENSIONS OF TIME WILL BE GRANTED.

May 10, Wednesday
CCE classes and examinations end.

May 15, Monday
Final grades due in the Office of the Registrar by 4 p.m.

May 20, Saturday
Graduate Commencement.

Summer Session 1995

NOTE: All courses taken by graduate students during summer sessions are subject to the same regulations regarding inclusion in programs of study and calculation of overall academic average, etc., as courses taken during the regular academic year. Students wishing to take directed studies or special problems courses during summer sessions must obtain individual approval for these courses from the Summer Session Office unless the specific offering is listed in the Summer Session Bulletin for that year. Students wishing to enroll for thesis or dissertation research during summer sessions must first determine that their major professors and/or members of their thesis or dissertation committees will be available and are willing to provide the necessary supervision. See also the important note at the end of this calendar regarding scheduling of examinations, including defense of theses, during summer session. See the Summer Session Bulletin available at the Summer Session Office.

June 2, Friday
Final date for nominations for August graduation.

July 14, Friday
Final date for all August degree candidates to submit completed master's and doctoral theses in a form acceptable for examination purposes, along with the request for oral defense of the thesis. NO EXTENSIONS OF TIME WILL BE GRANTED. *Theses must be submitted at least 20 calendar days prior to the date requested for the oral defense. Selection of date should allow sufficient time for necessary revisions and retyping before submission in final form. See deadline below.*

July 15, Saturday
Deadline for fall 1995 applications, except for programs with earlier deadlines.

August 11, Friday
Final date for all August degree candidates to submit, in final form, master's and doctoral theses which have been successfully defended. NO EXTENSIONS OF TIME WILL BE GRANTED.

August 31, Thursday
Deadline for international students to arrive on campus.

IMPORTANT NOTE: Requests for scheduling examinations must be submitted to the Graduate School Office at least 20 calendar days prior to the date(s) requested. Theses and dissertations must be distributed to members of the examining committee at least 15 days prior to the date of the defense. Oral and written examinations, including qualifying and comprehensive examinations and defense of theses, will be scheduled only at the convenience of the faculty members involved and depending on the availability of the candidate's program committee and additional qualified examiners. Such examinations will not be scheduled during periods when the University is in recess. Students wishing to take any examinations should first check as to the availability and convenience of the faculty members. Each faculty member must initial the request for scheduling the examination to indicate willingness to serve. The faculty should be consulted well in advance for examinations being scheduled during the winter intercession and summer session. If they are not registered for course work or research during the summer sessions, students should register for one credit of research to defend theses and for continuous registration to take the other examinations. Please note that persons on continuous registration do not have the privilege of consulting regularly with professors on research or thesis preparation, nor of using the University's laboratory, computer, or other educational facilities (except for the libraries).

THE UNIVERSITY

The University of Rhode Island is a medium-sized state university located in the southern part of Rhode Island in the village of Kingston. It was founded as a land-grant college in 1892. As the institution expanded, a wide range of educational and scholarly programs were developed. In part because of its location near the ocean, the University has developed strong marine programs and has been designated one of the national Sea Grant colleges.

The University enrolls about 12,200 students on its Kingston Campus, and another 3,000 in credit courses throughout the state. There are about 11,500 undergraduate students, about 3,600 graduate students, and a full-time teaching faculty of about 720.

The University has nine colleges and three schools: the Colleges of Arts and Sciences, Business Administration, Continuing Education, Engineering, Human Science and Services, Nursing, Pharmacy, Resource Development, and University College; the Graduate School, the Graduate School of Library and Information Studies, and the Graduate School of Oceanography.

Mission Statement. The University of Rhode Island is rooted firmly in the tradition of America's unique land-grant institutions—universities that exist to expand and transmit knowledge and to foster its application in the daily life of the nation.

As the state's flagship institution of higher learning, the University has three major responsibilities: to provide traditional as well as innovative opportunities for education at the undergraduate and graduate levels; to pursue research and other scholarly and creative activities; and to serve the unique needs of the people of Rhode Island by making knowledge and information readily available to individual citizens, to community groups, to school and educational agencies, and to business, industry, labor, and government.

At the heart of this university, like its counterparts across the nation, there is a strong core of traditional academic disciplines, such as history, physics, and economics. These are not only principal subjects of teaching and research, but they also provide the foundation for all specialized, professional, and applied areas of study.

One component of the University's approach to higher learning is the close student-teacher relationship and the consequent concern for the individual person. A low student-to-faculty ratio enhances the success of this vital component of the University's mission.

Because of its commitment to provide access for academically qualified and motivated students of all ages, the University maintains a variety of both traditional and nontraditional learning environments. Students who are part time, disabled, or somewhat older than traditional students, who are members of a minority group or are working while pursuing an education are served through a wide range of facilities in Kingston as well as through extensive academic and student services at the University's College of Continuing Education in Providence.

Campuses. The University has a spacious rural campus in Kingston, 30 miles south of Providence, in the northeastern metropolitan corridor between New York and Boston. The center of the campus is a quadrangle of handsome old granite buildings surrounded by newer academic buildings, student residence halls, and fraternity and sorority houses. On the plain below Kingston Hill are gymnasiums, athletic fields, tennis courts, and agricultural fields.

In addition to the Kingston Campus, the University has three other campuses. The Narragansett Bay Campus, six miles east of Kingston, overlooking the West Passage of the bay, is the site of the Graduate School of Oceanography. On its 165 acres are located academic and research buildings, a pier for research vessels, the Rhode Island Nuclear Science Center, and several federal laboratories devoted to the marine sciences. The College of Continuing Education, with main offices at 199 Promenade Street in Providence, offers courses throughout the state. The W. Alton Jones Campus, in the western section of the state, 20 miles from Kingston, has 2,300 acres of woods, fields, streams, and ponds devoted to environmental education and research. Conference facilities are also located on the campus.

Graduate Study

Graduate study at the University was inaugurated in 1907 with Master of Science degrees in chemistry and engineering. The Master of Arts degree was first awarded in 1951, and in 1960 the University awarded its first Doctor of Philosophy degree. Graduate work for professional degrees was initiated in 1962, when the degree of Master of Public Administration was first awarded. Today, the master's degree is offered in 56 areas of study and the doctorate in 37 areas. To date, over 15,000 master's degrees and 1,700 doctoral degrees have been conferred.

The Dean of the Graduate School has primary responsibility for administering policies and procedures relating to advanced study at the University of Rhode Island. Graduate School policy is formulated by graduate faculty members, acting through their delegate body, and the Graduate Council, which includes student members. Only the Dean or the Graduate Council can grant exceptions to the regulations for graduate study, which are explained in detail in the *Graduate Student Manual.*

The University graduate programs of study are listed on page 6. Work in a combination of special areas is often possible. Graduate-level course work applicable to a number of these programs is offered in several locations throughout the state by the College of Continuing Education. In most cases, however, a portion of the courses must be taken on the Kingston Campus.

Research

Within Rhode Island's system of higher education, the University has the major responsibility for graduate study, which is closely associated with a strong program of research. Specialized research, education, and public service projects are conducted in all departments and programs offering graduate degrees. Sponsored research throughout the University is supported by a total of approximately $45 million per year. Support comes from foundations, commercial firms, federal and state agencies, and the University. The University ranks among the top five percent of the country's colleges and universities in the amount of research funding received.

The vice provost for research, on behalf of the University, approves applications for research grants, maintains files of funding agencies, keeps a current facilities inventory, and is the liaison for the president, the provost, the business manager, the academic deans, the Research Committee, and the faculty in matters pertaining to general research policy.

The University's Research Office provides assistance to the University research community in all aspects of research and in the preparation of proposals.

Research Resources

University Libraries. The library collection of 1,040,000 bound volumes and 1,360,000 microforms is housed in the University Library in Kingston, at the College of Continuing Education in Providence, and in the Pell Marine Science Library on the Narragansett Bay Campus. The latter was designated the National Sea Grant Depository in 1971.

The University Library, which holds the bulk of the collection, has open stacks with direct access to books, periodicals, documents, maps, microforms, and audiovisual materials. The Special Collections Department collects and maintains rare books, manuscripts, the University archives, and a variety of special interest materials. Service hours at the other libraries vary, but the University Library provides full reference, bibliographic, and circulation services during most of the 90 hours per week it is open. Terminals linked to the Academic Computer Center are available in the library during the hours both facilities are open. A computer-based bibliographic system makes most books available to users one week after their receipt. Arrangements can be made to borrow out-of-print material from other libraries through the Interlibrary Loan Office in the University Library.

The University is a member of the Higher Education Library Information Network (HELIN), which extends borrowing privileges to the faculty, staff, and students of the Community College of Rhode Island, Providence College, Rhode Island College, Roger Williams University, and the University of Rhode Island. Holdings of all these libraries are included in the on-line public access catalog.

Academic Computer Center. The Academic Computer Center (ACC) provides computational resources needed by the University community for instruction and research. Located in Tyler Hall on the Kingston Campus, the ACC maintains central computing facilities, student microcomputing resources, and the campus high-speed network. The

Graduate Degree Programs

Master of Arts

Audiology
Comparative Literature
Education
- Adult Education
- Education Research
- Elementary Education
- Reading Education
- Science Education
- Secondary Education

English
French
History
Marine Affairs
Philosophy
Political Science
Spanish
Speech-Language Pathology

Master of Science

Accounting
Audiology
Biochemistry
Botany
Chemical Engineering
Chemistry
Civil and Environmental Engineering
Clinical Laboratory Science
Computer Science
Electrical Engineering
Entomology
Fisheries, Animal and Veterinary Science
Food Science and Nutrition
Geology
Human Development and Family Studies
- Human Development and Family Studies
- Marriage and Family Therapy
- College Student Personnel

Labor and Industrial Relations
Manufacturing Engineering
Mathematics
Mechanical Engineering and Applied Mechanics
Medicinal Chemistry
Microbiology
Natural Resources
Nursing
Ocean Engineering
Oceanography
Pharmaceutics
Pharmacognosy
Pharmacology and Toxicology
Pharmacy Administration
Physical Education
Physical Therapy
Physics
Plant Science
Psychology (School)
Resource Economics
Speech-Language Pathology
Statistics
Textiles, Fashion Merchandising, and Design
Zoology

Doctor of Philosophy

Applied Mathematical Sciences
- Applied Mathematics
- Applied Probability
- Computer Science
- Operations Research
- Statistics

Biological Sciences
- Biochemistry
- Botany
- Fisheries, Animal and Veterinary Science
- Food Science and Nutrition
- Microbiology
- Natural Resources
- Plant Pathology
- Plant Science
- Zoology

Business Administration
Chemical Engineering
Chemistry
Civil and Environmental Engineering
Economics—Marine Resources
Education
Electrical Engineering
English
Industrial and Manufacturing Engineering
Mathematics
Mechanical Engineering and Applied Mechanics
Nursing
Ocean Engineering
Oceanography
Pharmaceutical Sciences
- Medicinal Chemistry
- Pharmaceutics
- Pharmacognosy
- Pharmacology and Toxicology

Physics
Psychology
- Clinical
- Experimental
- School

Professional Degrees

Master of Business Administration (M.B.A.)
Master of Community Planning (M.C.P.)
Master of Library and Information Studies (M.L.I.S.)
Master of Marine Affairs (M.M.A.)
Master of Music (M.M.)
Master of Public Administration (M.P.A.)

ACC provides a variety of services to support these facilities and assists the campus community in their use. The computer network and related services have been expanding steadily since the center opened in 1959, and now a majority of the students, faculty, and staff use these resources. All students are entitled to a computer account which enables them to use ACC facilities, including access to worldwide electronic mail services.

The center has an IBM ES/9000 Model 210 VF mainframe computer running the VM/CMS operating system to provide computing support for interactive, batch, and client-server processor modes. A full complement of programming languages and packages is available. In addition, an IBM RISC System/6000 Power Server 560 running AIX 3.2.5 is available for Geographic Information System and computer-intensive applications. Extensive facilities for computer graphics are also offered using both video display facilities and a CalComp 58436 color electrostatic plotter for visualization. Several hundred personal computers, workstations, and terminals are located in public work areas and private offices. These devices are connected to the University Ethernet network, which provides access to the ACC systems and remote independent computers. Also available are extensive dial-up facilities as well as external network access to the INTERNET, BITNET, and the Rhode Island State Network. URI is also a Smart Node member of the Cornell National Supercomputer Facility, with both research and educational access to supercomputer facilities.

The ACC provides facilities management services for campus microcomputer laboratories featuring IBM PS/2s, Apple Macintoshes, and UNIX workstations. Numerous software applications are available. The microcomputer laboratories are available for faculty research, teaching, and general student use. Eight computer classrooms are available.

Other Research Facilities. The Department of Computer Science and Statistics operates both research activities and instruction within the department. At present, this facility includes a classroom equipped with 36 Macintosh computers, another classroom with 12 SUN workstations, and a VAX minicomputer. Additional SUN workstations

and Macintoshes are located in faculty and graduate student offices. All of the equipment is interconnected by a local area network. The Narragansett Bay Campus has a Prime 750 and a Microvax II for timesharing use, an educational computer laboratory with nine Macintosh computers, two DOS machines, two SUN workstations, and a high-speed data link to the Academic Computer Center. The College of Engineering has a VAX 4000/200 VMS minicomputer; a DECsystem 5000/200 RISC Ultrix server; 20 VAXstation 3100 graphics workstations; 75 IBM-compatible PCs (286i and 486i); and terminals in all engineering buildings. These and all other departmental computers are linked together by an internal college Ethernet network. Ethernet connects to the campus network, which includes the Academic Computer Center and the international INTERNET. The Department of Electrical Engineering has a SUN 4/490 SPARC server, 42 SUN and DEC UNIX workstations, and a variety of PCs and Macintoshes. The Department of Civil Engineering has a VMS cluster of four VAXstation 3100 graphics workstations and a Novell network of eight IBM PCs. The Department of Chemistry has a VAX 4000/200 VMS minicomputer, one HP and three DEC UNIX workstations, 20 IBM-compatible PCs, and six Macintoshes.

Four other computer facilities are available in the College of Business Administration. The Dennis W. Callaghan Microcomputer Laboratory, housed in the College of Business Administration, has 35 networked IBM-compatible 286I PCs and 12 Textronics 4307 terminals with access to the Novell file server and the campus-wide computer system network. The Champlin Room facility offers higher processing power with an IBM PS/2 model 70/386. This extensive computer capability is duplicated at the College of Continuing Education in Providence, on a somewhat smaller scale, so that both day and evening students can avail themselves of the latest in computer technology.

Other equipment includes major laboratories for digital pattern recognition and digital image processing, computer automation ("robotics"), optical properties of materials and microelectronics, and materials research, a mechanical properties testing facility, including an Instron 1125, several MTS SERVO-HYDRAULIC testing machines and a NETZSCH thermal analyzer, a field station for radiopropagation research, and reverberant and anechoic rooms for airborne acoustics work.

Equipment available for marine research includes chambers for leak-testing equipment prior to deep-sea use, marine geotechnical laboratory facilities for sediment testing, a wave and towing tank, underwater acoustics test facilities, a marine experimental aquarium, a marine ecosystem laboratory, and an oceanographic remote-sensing laboratory that processes sea surface data. The University also operates the Ocean Mapping Development Center for mapping the sea floor.

The University's research vessel, *Endeavor,* operated by the Graduate School of Oceanography, is a 185-foot ship capable of working in all parts of the world's oceans. It can carry a scientific party of 16. Also part of the fleet are a 59-foot, high-speed ocean research vessel, the *Laurie Lee,* and a 65-foot ocean engineering vessel, the RV *West Passage,* with equipment for imaging and sampling the sea bed. The University fisheries school operates a 52-foot-long training vessel, the *Cap'n Bert.* A number of smaller vessels are also available. The Graduate School of Oceanography also has a fully equipped research diving facility.

A research reactor and associated facilities are available to University students at the Rhode Island Nuclear Science Center, located on the Narragansett Bay Campus. Constructed and operated by the state of Rhode Island, this critical reactor is extensively used for research by many departments of the University. The reactor, designed for 5MW, is now operating at 2MW. Hot laboratories, counting equipment, neutron spectrometers (including a unique polarized-beam, small-angle instrument), and multichannel analyzers are also available.

The College of Nursing has practice laboratories equipped with a heart-sound simulator used by students in primary health care. The media center at White Hall contains various types of learning modules and microcomputers for research and instruction.

Housed in the Morrill Science Building, the URI Central Electron Microscope Facility has a JEOL 1200 EX scanning-transmission electron microscope (STEM). This is a high-resolution microscope with transmission, scanning, scanning transmission, and diffraction capabilities. Ultramicrotomes, carbon evaporators, darkroom facilities, and other equipment for specimen preparation are also available. The facility is available for use by graduate students and other University personnel, and for research projects and instruction. The facility is staffed by a director and a technical specialist who maintains the facility and assists and trains users. Advice in project design is also provided, and assistance with biological preparation is available by special arrangement. The facility welcomes projects of all sorts, in both the biological and physical sciences.

The Physical Therapy Program in the Keaney-Tootell complex has established a clinical research unit that includes a computerized BIODEX muscle performance testing dynamometry system, a METRECOM postural analysis system, and an ARIEL biomechanical analysis system for human motor performance assessment. Functional electrical stimulation for the spinal-cord injured and other neurologically impaired patients is made possible through a cooperative arrangement with the nonprofit organization, Shake-A-Leg, Inc. Clinical evaluation, treatment, and collaborative studies are possible in exercise science through cooperation with researchers in the Department of Physical Education and Health.

The Speech and Hearing Center has one-way vision and listening facilities and diagnostic equipment for speech and language testing. Sound-treated testing rooms meeting ANSI standards and audiometric equipment provide for audiologic evaluation and research.

Writing Center. The Writing Center provides assistance to anyone in the University community who needs help with any phase of writing a paper. The Writing Center is staffed by Department of English College Writing Program faculty and Department of English graduate students. Tutoring is provided by appointment on an individual basis, but walk-in appointments are sometimes available.

The center helps students become better writers and provides an environment in which writers can write with paper and pencil or on one of the center's Macintosh computers. Students can use an array of software, including word-processing software, to produce

their work with support from center staff. The computers and software in the Writing Center are compatible with those in other labs campus-wide.

The center is open approximately 40 hours per week, including daytime and evening hours. Appointments for tutoring can be made by calling 401-792-4690, or by visiting the center in Room 313, Independence Hall.

Research Units

In addition to the research in various departments, the following special research agencies have been established.

Agricultural Experiment Station. This station within the College of Resource Development is the designated Rhode Island/USDA partnership organization for research in the agricultural sciences. Basic and applied investigations in natural and human resources are carried out by 54 senior scientists assigned to college departments. Their research promotes conservation and management of resources, improvement of the quality of environment, enhancement of home life, and support of resource-using business and industry. A strong orientation toward estuarine and marine issues and an interdisciplinary approach to resource research are characteristics of the station. The progress of research and complete results of individual projects are published in station bulletins, which are available to Rhode Island residents upon request.

Aquaculture Center, East Farm. The Department of Fisheries, Animal and Veterinary Science maintains a facility for the study of fish biochemistry, physiology, and pathology at East Farm, near the main campus. The 4,000-square-foot building houses circular fiberglass rearing units, bioassay tanks, and smaller tanks for individual studies. Although the research emphasis is on Atlantic salmon—the center rears 40,000 salmon in its tanks—there are also rearing tanks for lake, brook, and rainbow trout. In addition, the center maintains a net pen with 3,000 Atlantic salmon at Casey Point in Saunderstown, about nine miles from the main campus.

Biotechnology Center. This center was established to coordinate and foster interdisciplinary research in the agricultural, medical, marine, and food sciences and their supporting basic science disciplines. It provides a structure to encourage interaction among the academic, governmental, and industrial sectors of the state economy. The center identifies new research opportunities and organizes seminars and workshops on topics in biotechnology. While the center is not an academic unit of the University, it identifies potential study areas in biotechnology for the various departments of the University at the graduate and undergraduate levels. It is administered in the College of Resource Development by a steering committee with a chairman selected from the college.

Cancer Prevention Research Center. The center, which includes the Self-Change Laboratory, is a multidisciplinary research facility supported by the National Cancer Institute, the American Cancer Society, the Centers for Disease Control and Prevention, and the Johnson & Johnson Corporation. The center is dedicated to research that will enhance the quality and quantity of life through health promotion and disease prevention. Basic research has generated a leading model of how people change chronic problem behaviors, such as addictions, unhealthy diets, sedentary lifestyles, high-risk sexual behavior, sun exposure, and depression. Applied research has generated innovative interventions, including computer-driven expert systems and proactive counseling protocols that reach high percentages of people at risk for cancer and other chronic diseases.

Center for Atmospheric Chemistry Studies (CACS). The center, part of the Graduate School of Oceanography, is a focal point for the development of a broad-scale research effort in the transport, reactions, and impact of substances carried through the atmosphere. It provides a resource in the research of atmospheric chemistry and air pollution for the state of Rhode Island, and participates in several multi-institutional, multinational research programs investigating global-scale problems in atmospheric chemistry.

Center for Vector-Borne Disease. The mission of the center is to promote interdisciplinary research and student training in all areas related to human disease from arthropods and wildlife. Studies focus on important regional diseases such as Lyme disease, babesiosis, and mosquito-borne encephalitis. Ongoing projects include disease prevention programs, surveillance and risk assessment strategies, vector control, and the development of appropriate community-based interventions. Working closely with local, state, and federal agencies as well as industry partners, faculty from such diverse disciplines as animal sciences, entomology, microbiology, statistics, mammalogy, ornithology, plant sciences, behavior modification, and nursing are involved in the center's programs. Several of the projects include tracking new or emerging infections and advising citizens on measures for protection.

Child Development Center (CDC). The CDC is part of the Department of Human Development and Family Studies. It serves as a research site, with the children, their families, and staff participating in studies conducted by University faculty and students. Investigations focus on a range of topics related to the social, emotional, physical, and cognitive development of young children; the creation and management of early-education environments; and relationships between teachers and children, teachers and parents, and parents and children.

Coastal Resources Center (CRC). In 1971, the governor of Rhode Island requested that the URI Graduate School of Oceanography establish the Coastal Resources Center to assist the state in formulating strategies for managing its coastline. By the mid-seventies, CRC was drafting the state's coastal management program, assisting the New England Regional Commission in the resolution of issues posed by offshore oil development, and preparing special area management plans for critical geographic areas of Rhode Island. In 1984, numerous projects with a national scope, including an interdisciplinary study of the management of U.S. estuaries since 1950, were undertaken. A major international program was started in 1985 to assist developing nations in the management of their coasts. As part of its central activity of formulating management strategies, CRC designs research projects to improve the understanding of specific resource issues, provides technical assistance and training, and develops programs that involve the public in coastal management initiatives.

Cooperative Extension. This nationwide outreach education system was established by federal legislation and is a partnership of the U.S. Department of Agriculture, state land-grant universities, and local governments. District offices are located in East Greenwich (serving Kent and Washington Counties), Greenville (Providence County), and Newport (Newport and Bristol Counties). The mission of Cooperative Extension at URI, which is housed in the College of Resource Development, is to teach people how to improve their lives and their communities using scientific information produced by the University's research centers. It addresses the economic, social, and environmental issues important to Rhode Island citizens and covering these broad areas: home economics and family living, 4-H youth development, and agricultural and community resource development.

Design for Manufacture Research Center. The center is based in the Department of Industrial and Manufacturing Engineering. It involves undergraduates, faculty members, and graduate research assistants, at both master's and doctoral levels. Center research is concerned with the relationships between product design decisions and manufacturing efficiency. Topics considered include product structure analysis, comparison of material and process selections, and product design for manufacturing automation. The center's goal is to produce database analysis tools that can be used by product development teams. Funding is provided by the National Science Foundation and various industries in the United States.

Environmental Data Center (EDC). The EDC is a spatial data analysis laboratory in the Department of Natural Resources Science. The EDC specializes in using Geographic Information System data-processing tools to solve environmental problems. The lab is one of the custodians of the Rhode Island Geographic Information System database, which consists of accurate and up-to-date cartographic data on Rhode Island's soils, wetlands, land use, geology, hydrography, and numerous other categories of information. These data are available to the URI academic community for teaching and research applications. Students and research staff of the laboratory are currently engaged in research projects with the Rhode Island Department of Environmental Management, the Environmental Protection Agency, the National Park Service, the Soil Conservation Service, and the National Oceanic and Atmospheric Administration. Computing is done on Data General AViiON workstations, microcomputers, and the University's IBM mainframe. The EDC maintains a Global Positioning System base station and has hardware and software for processing remotely sensed data.

Exercise Science Laboratories. These laboratories consist of the Human Performance Laboratory, the Kinesiology Laboratory, and the Computer Laboratory, all housed in the Tootell-Keaney complex. They offer measurement and exercise counseling services to local, state, and regional agencies, industrial corporations, established exercise programs, athletic teams, and individuals with medical referrals. They serve as teaching and research units for undergraduate and graduate students focusing on exercise science and fitness. In addition, the Independence Square II building houses three exercise science laboratories, a Cardiopulmonary Laboratory, an Energy Metabolism Laboratory, and a Microscopy/Image Analysis Laboratory dedicated to faculty and student research. The Cardiopulmonary Laboratory also serves the clinical programs in cardiac rehabilitation and community fitness.

Faculty Institute on Writing. The goals of the institute are to introduce and promote good writing in disciplines across the curriculum, to help all faculty and students understand the role of writing in learning, and to help the University make good writing the center of a quality education. Faculty members, who are drawn from various departments, meet in writing workshops during the year and also conduct research on writing.

Family Therapy Clinic. This is an integral part of the graduate training program in marriage and family therapy in the Department of Human Development and Family Studies. Established in 1982, it is located at the Transition Center on Lower College Road. The Family Therapy Clinic provides counseling services to families and clinical supervision to graduate students. It creates research opportunities for both graduate students and faculty members in family interaction and family systems. Various assessment tools are used to give feedback to families served and to graduate student therapists, and to produce a database for ongoing research. The clinic promotes the use of its facilities by local families and accepts referrals from the Rhode Island Family Court, school systems, clergy, and health personnel.

Family Violence Research Program. Established in 1973, the program is designed as a research, teaching, and training program in the area of family violence. It is supported by grants from the National Institute of Mental Health, the National Center on Child Abuse and Neglect, the National Institute of Justice, the National Science Foundation, the Harry Frank Guggenheim Foundation, and the Robert Wood Johnson Foundation. The program offers a formal course through the Department of Sociology and Anthropology, as well as training in the field of family violence to local, state, national, and international professional groups and organizations.

Food Science and Nutrition (FSN) Research Center. The FSN center has been designed to house all the graduate education and research programs in food science and nutritional science. The center is administered by the College of Resource Development and is located in West Kingston. In addition to its own microcomputer facilities, the center has 16 fully equipped research laboratories, including those dedicated to carotenoid chemistry, vitamin A, nutrient interaction, food bioprocessing, physical properties of food, industrial microbiology, food chemistry, food biochemistry, and food safety. There is a research winery with its own walk-in cold room and incubators, and a low-temperature laboratory for biochemical and microbiological studies. The Animal Laboratory conforms to all federal codes for animal research, with separate rooms available for toxicological, radioactive, and growth studies. The center also has both food processing and seafood processing pilot plants. It has the facilities and equipment to provide instruction, research, and service in the fields of food science and nutrition.

Historic Textile and Costume Collection. A historic costume and textile collection of over 16,000 items is housed in the Department of Textiles, Fashion Merchandising, and Design. The collection, of national significance, features nineteenth- and twentieth-century fashionable clothing, ethnic textiles and costumes, accessories, samplers, coverlets, quilts, and shawls. Faculty and a full-time curator are available to assist scholars, museum professionals, and the general public with problems of classification, identification, conservation, and storage of textile items. Textile conservation services are available.

Institute for International Business. The institute seeks to encourage and support interdisciplinary research, education, and training in the field of international business, drawing on University faculty and outside resources to serve the needs of the business community and to enrich the academic and outreach programs of the College of Business Administration. The institute attempts to coordinate its efforts with those of other University offices, centers, and programs concerned with international research and education.

Institute of Human Science and Services. The institute sponsors research and support activities in the human sciences and services, particularly in the areas of evaluation, measurement, survey research, curriculum development, training, and human services policy and management. Institute activities focus on areas including education, human development, the family, gerontology, exercise science, consumer affairs, counseling, and public policy. The institute is an integral part of the College of Human Science and Services and draws its professional staff from all departments of the college. The institute maintains a close liaison with human service agencies such as the Rhode Island Department of Education, the Rhode Island Social and Rehabilitative Services, and the Rhode Island Institute of Mental Health, Rehabilitation, and Hospitals.

Intergovernmental Policy Analysis Program (IPAP). Created by the University in 1978 as a means to improve the responsiveness of the University to the needs of state government, IPAP is currently organized as an office under the provost. As a research unit, IPAP works to provide an innovative program that can meet many of state government's critical and short-term needs as well as long-term requirements. Since its inception, IPAP has received grants from state government agencies to assist in research design, resource development, and policy analysis, and has coordinated the state's Executive and Legislative State Science, Engineering, and Technology Programs with funding from the National Science Foundation. In addition, other grant projects have been funded by regional and federal governments and by private research organizations.

Kirk, Chester H., Applied Engineering Laboratory. The filtration research laboratory at the University is one of a few laboratories nationwide studying filtration processes from a fundamental point of view. At the heart of this center is a generous donation of equipment made by the Fram Corporation, a division of the Allied Corporation. This includes a two-channel, computer-controlled laser anemometer system, a SUN workstation, and two Apollo computers, a low-turbulence level wind tunnel, a water channel, extensive instrumentation for the generation and analysis of aerosols, and a variety of other instrumentation and equipment. The laboratory is housed in the Kirk Building, has associated faculty from the Departments of Mechanical and Chemical Engineering, and has access to other expertise within the College of Engineering and the University, as needed. The laboratory excels in its focus on developing a basic scientific understanding of filtration and separation processes, and in its intention to maintain close ties with the industrial applications for its work.

Labor Research Center. The Labor Research Center is a tripartite, independent, multidisciplinary unit devoted to the study and teaching of subjects broadly defined as labor and industrial relations. The center is concerned with research and service as well as the administration of the graduate program leading to the M.S. degree in labor and industrial relations. More than 50 full-time University faculty members from three colleges and 13 departments are associated with the center in either a teaching or research capacity. Labor, human resource management, and neutral external advisory committees work with the center's director and faculty in helping to define research and program needs and interests.

Laboratories for Textile Performance Testing. These laboratories in the Department of Textiles, Fashion Merchandising, and Design evaluate textile performance, analyze fibers and fabrics, test for quality control, and solve dyeing and finishing problems. Faculty provide technical assistance to business, industry, the Rhode Island Attorney General's Office, and consumers. Equipment is available for performing a wide range of standard tests recommended by federal agencies and national standard-setting organizations and is widely used by industry. The laboratories also have two reflectence spectrophotometers for color measurement of textile and nontextile items.

LANDSAT Remote Sensing Laboratory. This facility is a cooperative effort between the Graduate School of Oceanography and the Department of Marine Affairs and was established to use satellite remote sensing for terrestrial, coastal, and nearshore applications. Considerable emphasis is placed on the application of remote-sensing techniques to the solution of problems faced in both the public and the private sectors. Academic training and research concerning the classification of LANDSAT remote-sensing data are important functions of the laboratory, where individuals with differing research interests are provided opportunities to work together using state-of-the-art technology. The laboratory is staffed by professionals with in-depth backgrounds in satellite remote sensing.

Marine Pathology Laboratory, East Farm. This laboratory, part of the Department of Fisheries, Animal and Veterinary Science, studies the diseases of aquatic animals, mostly to gauge the effects of pollution on natural populations. It offers diagnostic assistance to aquaculture researchers, and has a cooperative arrangement with the National Marine Fisheries Service. There is a large tank room of enclosed systems in which fish (tilapia, an important food fish in developing countries; fathead minnow; carp; goldfish; and swordtails, among others) are exposed to variables such as heavy metals and bacteria to study the effects of these factors on the fishes' immune systems. Facilities include light and electron

microscopes, a wet laboratory for both salt and freshwater fish, holding tanks, a postmortem laboratory, a bacteriology laboratory, and a fully equipped histopathology laboratory with a video monitoring system for microscopic analysis of tissue. Available to researchers is the laboratory's extensive slide collection of fish and sea turtles.

National Sea Grant Depository. Housed in the Claiborne Pell Marine Science Library, the depository was established in 1971 to ensure that materials published under Sea Grant auspices would be available at a single location. Its subject matter covers a wide variety of marine subjects, including oceanography, marine education, aquaculture, fisheries, coastal zone management, marine recreation, and law. The National Sea Grant Depository publishes abstracts quarterly, makes available loan copies of Sea Grant documents, and conducts online literature searches.

Office of Marine Programs (OMP). Housed in the Marine Resources Building, OMP is responsible for the public education, institutional advancement, communications, and public relations activities of the Graduate School of Oceanography. OMP manages the Narragansett Bay Classroom, Friends of Oceanography, GSO alumni affairs, campus tours and public events; coordinates the JASON Project; and publishes the *GSO Curriculum Bulletin, Maritimes,* and *At the Bay Campus*. OMP also serves as the administrative home of the URI Marine Programs Advisory Council and the National Sea Grant Depository.

Office of Nursing Research Enhancement (ONRE). ONRE is a partnership between the College of Nursing and nursing practice settings to provide initiatives for clinical research and education. It supports an environment that encourages mutual respect, inquiry, and education in each encounter and provides curriculum content for students, care givers, and faculty. Its goals are to 1) teach research-related skills, 2) provide access to nursing research, 3) disseminate research findings and apply them to clinical practice, and 4) promote clinical investigations among nurses by establishing nurse scientists and clinical research teams. Clinicians and students work along with faculty in research studies by identifying problems, helping the faculty researchers gain access to clinical sites, influencing instrument development, and collecting data.

Pacific-Basin Capital Markets (PACAP) Research Center. The PACAP Research Center is dedicated to creating, maintaining, and distributing capital market databases for 11 nations in the Pacific-Basin region; promoting academic research and teaching programs for a better understanding of the region's capital markets; and providing an international forum for global communities of business, government, and academia to exchange research ideas and findings and disseminate relevant information that affects the region. The center also organizes the PACAP Finance Conference each year. Through the many programs launched by the PACAP Research Center, URI maintains close relationships with stock and futures exchanges in the Pacific-Basin region and in the United States, multinational brokerage houses, and leading universities in Asia. URI is now the primary source of Asian capital markets information and is a driving force for academic research on Pacific-Basin capital markets.

Research Center in Business and Economics. The center provides research support for the College of Business Administration faculty and conducts research projects for external organizations. It compiles the state's Index of Leading Economic Indicators, conducts the statewide Consumer Confidence Polls, and manages all research for the Rhode Island Defense Economic Adjustment Project. It has also provided survey research, concept testing, and other analytic services to a variety of external organizations.

Research Institute for Telecommunications and Information Marketing (RITIM). The institute fosters, encourages, and supports research and education in telecommunications and information marketing, drawing on University faculty and outside resources to serve the needs of the business community and to enrich the academic and outreach programs of the College of Business Administration. The institute is administered outside the departmental structure under the leadership of a director who reports to the Dean of the College of Business Administration.

Rhode Island Sea Grant College Program. Established in 1968 in the Graduate School of Oceanography, the Sea Grant Program acts as a focal point in a partnership that includes government, industry, and the University in an effort to increase scientific understanding of the oceans and coastal waters, improve management of marine resources, and promote development of marine products. The program consists of research, education, and advisory services, and is funded by the National Oceanic and Atmospheric Administration in the Department of Commerce.

Rhode Island Sea Grant Marine Advisory Services. The Marine Advisory Services is a federal and state collaboration in marine outreach. Marine specialists provide education and information and technology transfer programs to the marine community in Rhode Island and New England. Specialists work with commercial fishermen, seafood processors, marina and boatyard operators, local and state governments, and individuals and businesses interested in the management, use, development, or understanding of marine resources. Programs promote better use of marine resources by encouraging cooperation among marine-oriented agencies and groups.

Rhode Island Water Resources Center. This is the state center for research and training in all phases of water resources. Similar centers in each of the 50 states and the District of Columbia as well as Guam, Puerto Rico, and the Virgin Islands were established by law in 1964 and work cooperatively with the federal government in an effort "to assist in assuring the nation at all times of a supply of water sufficient in quantity and quality to meet the requirements of its expanding population." The center, which is housed in the Department of Civil and Environmental Engineering, also works with faculty members of other University departments, with faculty members of other Rhode Island academic institutions, and with state agencies.

Robotics Research Center. The center involves undergraduates, master's and doctoral degree candidates, staff, visiting engineers, and faculty in the Departments of Electrical, Mechanical, and Industrial and Manufacturing Engineering. Their research deals with the

application of advanced sensor-based systems, including robots, to flexible manufacturing workstations that deal with parts and components of a scale that can be normally handled by humans. Research in robotics began at the University in 1971 and was expanded in 1975 when the National Science Foundation (NSF) provided a significant level of long-term funding. In 1980, the Industrial Participation Program was initiated; it consists of companies involved both in the production of robots and in their employment in the production process. The NSF provided further funding in 1982 by establishing the only NSF University/Industry Cooperative Research Center in Robotics. The center is housed in the Kirk Applied Engineering Laboratory building.

Thin Film Laboratory. This laboratory is supported by a number of government agencies and private corporations, including the Rhode Island Center for Thin Film and Interface Research. Its primary focus is to develop new thin film materials with unique properties and to design thin film coatings for specific applications. These applications include novel microelectronic devices; thin film sensors to measure pressure, strain temperature, radiation, and moisture; corrosion- and oxidation-resistant coatings; phosphors and electrodes for flat panel displays; and thin film dielectrics for waveguides and capacitors. The laboratory facilities include state-of-the-art equipment for the disposition and characterization of thin film materials and devices. This equipment includes a Perkin-Elmer Surface Analyzer complete with SIMS, ESCA, Auger capability and an ISI-SEM with chemical analysis. Complete micro-lithography facilities also exist within the Thin Film Laboratory, which can design and generate photomasks capable of extremely fine geometries.

Urban Field Center. Located in the city of Providence, the Urban Field Center is a part of the graduate curriculum in community planning and area development in the College of Resource Development. A major goal of the center is the development of applied research and technical assistance skills for cities, educational systems, community groups, and the state agencies of Rhode Island. The center has developed an agenda for community service and urban outreach in collaboration with community groups.

URI-NOAA Cooperative Marine Education and Research (CMER) Program. The CMER Program was established when the University was designated a Center of Excellence in Coastal Marine Studies by the National Oceanic and Atmospheric Administration (NOAA). The program's purpose is to foster closer interaction between elements of NOAA and the University, strengthening both organizations in the process and enhancing NOAA's ability to address issues of regional and national concern. The program is also intended to provide technical training in marine-related disciplines, primarily on the graduate and professional levels. Cooperative activities have included joint research and the posting of NOAA personnel as adjuncts to the University faculty.

Women's Health Research Project. The project focuses on issues relevant to the physical, mental, and emotional health of women, with particular emphasis on the prediction and prevention of HIV risk, sexual abuse, substance abuse, and psychosocial problems for women in Rhode Island. The staff includes a dozen University faculty and students as well as researchers from Brown University and Memorial Hospital. Funding is currently provided by the National Institute of Mental Health.

Accreditation

The University of Rhode Island is accredited by the New England Association of Schools and Colleges. In addition, certain courses and programs of study have been approved by national accrediting agencies.

The New England Association of Schools and Colleges is a nongovernmental, nationally recognized organization whose affiliated institutions include elementary schools through collegiate institutions offering postgraduate instruction.

Accreditation of an institution by the New England Association indicates that it meets or exceeds criteria for the assessment of institutional quality periodically applied through a peer group review process. An accredited school or college is one that has available the necessary resources to achieve its stated purposes through appropriate educational programs, is substantially doing so, and gives reasonable evidence that it will continue to do so in the foreseeable future. Institutional integrity is also addressed through accreditation.

Accreditation by the New England Association is not partial, but applies to the University as a whole. As such, it is not a guarantee of the quality of every course or program offered, or of the competence of individual graduates. Rather, it provides reasonable assurance about the quality of opportunities available to students who attend the University.

Inquiries regarding the status of an institution's accreditation by the New England Association should be directed to the administrative staff of the school or college. Individuals can also contact the association at 209 Burlington Road, Bedford, MA 01730. Phone: 617-271-0022.

The national accrediting agencies that have approved the quality of certain course offerings and programs of study include the American Assembly of Collegiate Schools of Business, the American Association of Marriage and Family Therapy, the American Chemical Society, the American Council on Pharmaceutical Education, the American Institute of Certified Planners and Association of Collegiate Schools of Planning, the American Library Association, the American Psychological Association, the American Speech-Language-Hearing Association, the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, and the National League for Nursing. The Doctor of Philosophy programs in clinical and school psychology are accredited by the American Psychological Association. In addition, the University has been authorized under federal law to enroll nonimmigrant alien students.

The University is also an approved member institution of the American Association of University Women, the American Council on Education, the Council of Graduate Schools, the North American Association of Summer Sessions, the National Association of State Universities and Land-Grant Colleges, the Northeastern Association of Graduate Schools, and the National University Extension Association.

Graduate Life

The main campus of the University of Rhode Island is located in the quiet, historic village of Kingston. Cultural variety and compact size are combined in the state of Rhode Island, and other cultural centers are easily accessible. Boston is 80 miles to the north and New York City 160 miles southwest. Bus service to these cities, as well as to Providence, Newport, and Cape Cod, is available from the campus. There is also a local bus service. The Kingston Amtrak station is two miles away.

Services. The recreational and cultural facilities of the campus are open to graduate students and include use of the Memorial Union building. Facilities there include meeting and conference rooms, lounges, a browsing room, study rooms, a darkroom, a radio station, campus newspapers, a games room, offices for student organizations, student technical services, a convenience store, a cafeteria, a restaurant, an optical shop, a music shop, a ballroom, a party room, and a scheduling and information office.

Services provided include a bookstore, a credit union, a travel agency, a unisex hair salon, a flower shop, a pizza shop, an ice cream and pastry shop, and a center where copying facilities and typewriters are available. Student cooperatives under the direction of the Student Senate include a record shop, photography lab, housing directory, book exchange, and student hostel. There are substantial facilities for commuting students. A variety of small, privately owned shops and restaurants are within walking distance of campus.

Every effort is made to provide graduate students with opportunities for consultation and advice on matters of concern to them in their academic, extracurricular, and personal lives. Descriptions of available services and facilities, including those associated with religious life, may be found in the *Undergraduate Bulletin.* Of particular interest to graduate students are the following: the Counseling Center and the Office of Career Services, both in Roosevelt Hall; Health Services, in the Potter Building; the Office of International Students and Scholars, in the International Center; Religious Counselors, in Taft Hall, Roosevelt Hall, the Catholic Center, and Hillel House; and the Student Financial Aid Office, in Roosevelt Hall.

Health Services. University health services include special clinics in gynecology, family planning, internal medicine, surgery, orthopedics, nutrition, psychiatry, and dermatology, as well as general medical and nursing care, laboratory, X-ray, and pharmacy. Allergy injections are given, provided the vaccines are supplied.

Outpatient services during the academic year are available seven days a week, 24 hours a day, except for certain holidays and periods when the University is closed. Physicians are available either for direct services or on call. Nurses are on duty at all times during the academic year. Specialists are available by appointment only at specific times.

Hospital care is available in the local community. All medical expenses incurred outside the University's Health Services are the responsibility of the student. Therefore, students are encouraged to have adequate insurance coverage (see the Health Services brochure *To Your Health*). Students who choose a private physician must assume responsibility for expenses incurred.

The Health Education Department is located in the rear of the Potter Building. Health Education is designed to provide a variety of services to promote and enhance personal health and well-being. Information that encourages a healthy lifestyle is provided. The department sponsors wellness clinics, outreach activities, and awareness days. A registered dietitian is available at the department, by private appointment, for nutrition counseling and education.

Affirmative Action and Nondiscrimination. The University of Rhode Island prohibits discrimination on the basis of race, sex, religion, age, color, creed, national origin, disability, or sexual orientation, and discrimination against disabled and Vietnam era veterans, in the recruitment, admission, or treatment of students, the recruitment, hiring, or treatment of faculty and staff, and the operation of its activities and programs. This is in compliance with state and federal laws, including Titles VI and VII of the Civil Rights Act of 1964, as amended, Title IX of the 1972 Education Amendments to the Higher Education Act, Executive Order 11246, as amended, Sections 503/504 of the Rehabilitation Act of 1973, as amended, Section 402 of the Vietnam Era Readjustment Assistance Act of 1974, and the Americans with Disabilities Act of 1990.

The Dean of the Graduate School, the director of Career Services, the director of the Counseling Center, and the director of the (undergraduate) Special Programs for Talent Development cooperate to provide information and guidance for economically and socially disadvantaged individuals seeking opportunities for graduate study at the University. Inquiries may be directed to any of these offices.

Most buildings on campus are architecturally available to the disabled, and provision is made to ensure that no student is prevented from pursuing a course of study because of restricted access to buildings. Special counseling for physically, psychologically, or vocationally disabled individuals is available at the Counseling Center.

Inquiries concerning compliance with antidiscrimination laws should be addressed to the Affirmative Action Officer, Carlotti Administration Building, or to the Director, Office for Civil Rights, Department of Education, Region I.

Students with Disabilities. Approximately 500 students have identified themselves as disabled. A full range of services is offered by the University through the Office of Student Life. Individuals who need disability assistance, sign language interpretation, or use of an FM personal sound system for University programs or activities should call 401-792-2285 (TDD/voice) 72 hours in advance. For more information about individualized services and accommodations, please contact the Assistant Director of Student Life for Disability Services, 332 Memorial Union. Phone: 401-792-2101.

Graduate Student Association (GSA). This organization is interested in both the academic and the social aspects of graduate life. Officers and representatives of the association are elected annually from the entire graduate student body, and the association is represented on the Graduate Council. The GSA offices are located in the Memorial Union. Phone: 401-792-2339.

There are also organizations for spouses of graduate students and for students from foreign countries.

Housing. The Graduate Village and several other buildings provide 140 units of unfurnished apartments for graduate students. There is a waiting list for these units; interested students should write to the Office of Housing and Residential Life for applications and for additional information. The majority of off-campus housing, located in nearby resort areas, is available only on a seasonal basis, from September to June. Since most of these rentals are five miles or more from campus, people without cars should investigate the availability of public transportation. A local bus service connects the shopping and service areas in Wakefield with the University. Some of the outlying resort areas, including Narragansett Pier, Galilee, and Scarborough, are also included in the bus routes. Bus service is also available to the Amtrak railroad station and Green Airport, and to Newport and Providence.

Housing information may be obtained from the Office of Housing and Residential Life and from advertisements in the *Narragansett Times,* a local newspaper. In addition to providing information and applications for University housing, the office has available maps, bus schedules, rental booklets, and a graduate roommate file. A list of off-campus rooms, apartments, and houses available to graduate students is maintained in the Commuter Lounge at the Memorial Union.

Housing arrangements should be made as early as possible. The Office of Housing and Residential Life is located in the Roger Williams Complex. Phone: 401-792-2215.

Dining Services. Dining services are available for graduate students at any of the University dining halls. Students who reside in University dorms are required to choose from one of the following options: any 10 meals Monday through Friday; any 15 meals Monday through Sunday; any 20 meals Monday through Sunday. Off-campus commuters and members of the campus community other than dorm residents may choose to purchase any five meals Monday through Sunday. Further information can be obtained by contacting the central office of Dining Services, Memorial Union. Phone: 401-792-2055.

Academic and Social Codes. Each student is a member of the University community, with all the rights, privileges, and responsibilities that go with such membership. The rights and privileges include full use of the educational opportunities and facilities offered on campus. The responsibilities include those of making proper use of these facilities in order to progress educationally, respecting the rights of others, and knowing and obeying the rules and regulations developed by the University community for the good of the total membership.

The University expects that all course papers, theses, and dissertations will be prepared, and all examinations taken, in conformance with accepted standards of academic integrity. This includes the proper citation and attribution of all material that is not the original product of the writer. It is the graduate student's responsibility to determine the appropriate style used in his or her discipline for presentation of material derived from other sources and to adhere to it scrupulously in all written presentations.

University Ombud. The ombud investigates complaints from students, faculty, and administrative personnel that they have been unfairly dealt with in the normal channels of administrative process. An opportunity is thus provided for a personal appeal to an impartial official with broad perspective who has ready access at all levels to those involved in a grievance. The ombud is always available to receive complaints, inquire into the matters involved, and mediate or otherwise resolve the problem. However, the ombud does not become involved with the normal operations of established procedures as outlined in the *Graduate Student Manual,* except where they are not functioning as intended.

Confidentiality of Student Records

Procedures for the release and disclosure of student records maintained by the University are in large measure governed by state and federal laws. Where the law is silent, the University is guided by the principle that the privacy of an individual is of great weight and that as much information in a student's files as possible should be disclosed to the student upon request. A current or former student has the right to inspect or review official records, files, and data directly related to that student. This right does not extend to applicants, those denied admission to the University, or those who were offered admission but did not enroll.

Some records not available to students are: letters of recommendation obtained or prepared before January 1, 1975; letters of recommendation that the student has waived his or her right to inspect; employment records of students as University employees; clinical, medical, counseling, or psychiatric records; parents' financial aid records; and campus law enforcement records.

A student may challenge the factual and objective elements of the content of student records, but not the qualitative and subjective elements of grading. If the student objects to certain items included in his or her personal records, there is a grievance procedure that can be followed. Ultimately, a Hearing Board on Student Confidential Records could render a decision.

Third parties do not have access to personally identifiable records or information pertaining to a student without the written consent of the student who specifies that the records be released. Federal law requires that parents be considered third parties.

Detailed guidelines for the release and disclosure of information from student records are available from the Office of Student Life. They comply with the legal requirements of the Family Educational Rights and Privacy Act of 1974, as amended.

Notice of Change

Rules, regulations, dates, tuition, fees, the availability and titles of programs and areas of specialization, their administrative location, and courses set forth in this bulletin are subject to change without notice. Where a change in program requirements is made while a graduate student is currently enrolled, the student may elect to complete the program under the requirements in effect at the time of matriculation or to shift entirely to the new requirements, but may not choose parts of each set. As a result of the ongoing reviews of all graduate programs, certain offerings and specializations may be deleted or restructured between editions of the *Graduate Bulletin.*

DEGREE REQUIREMENTS

Each advanced degree awarded by the University requires as a minimum the successful completion of a specified number of approved credits of graduate study at the University and the passing of prescribed examinations. Credit hours for a master's or doctoral degree may include formal course work, independent study, research, preparation of a thesis or dissertation, and such other scholarly activities as are approved by the candidate's program committee and the Dean of the Graduate School.

It is the student's responsibility to know the calendar, regulations, and pertinent procedures of the Graduate School and to meet its standards and requirements. These are set forth in this bulletin, the *Graduate Student Manual,* the *Statement on Thesis Preparation,* and other publications, all of which are available to graduate students at the Graduate School Office. These documents are also available in some department offices. The Manual is available at the library and, for a fee, at commercial centers in Kingston.

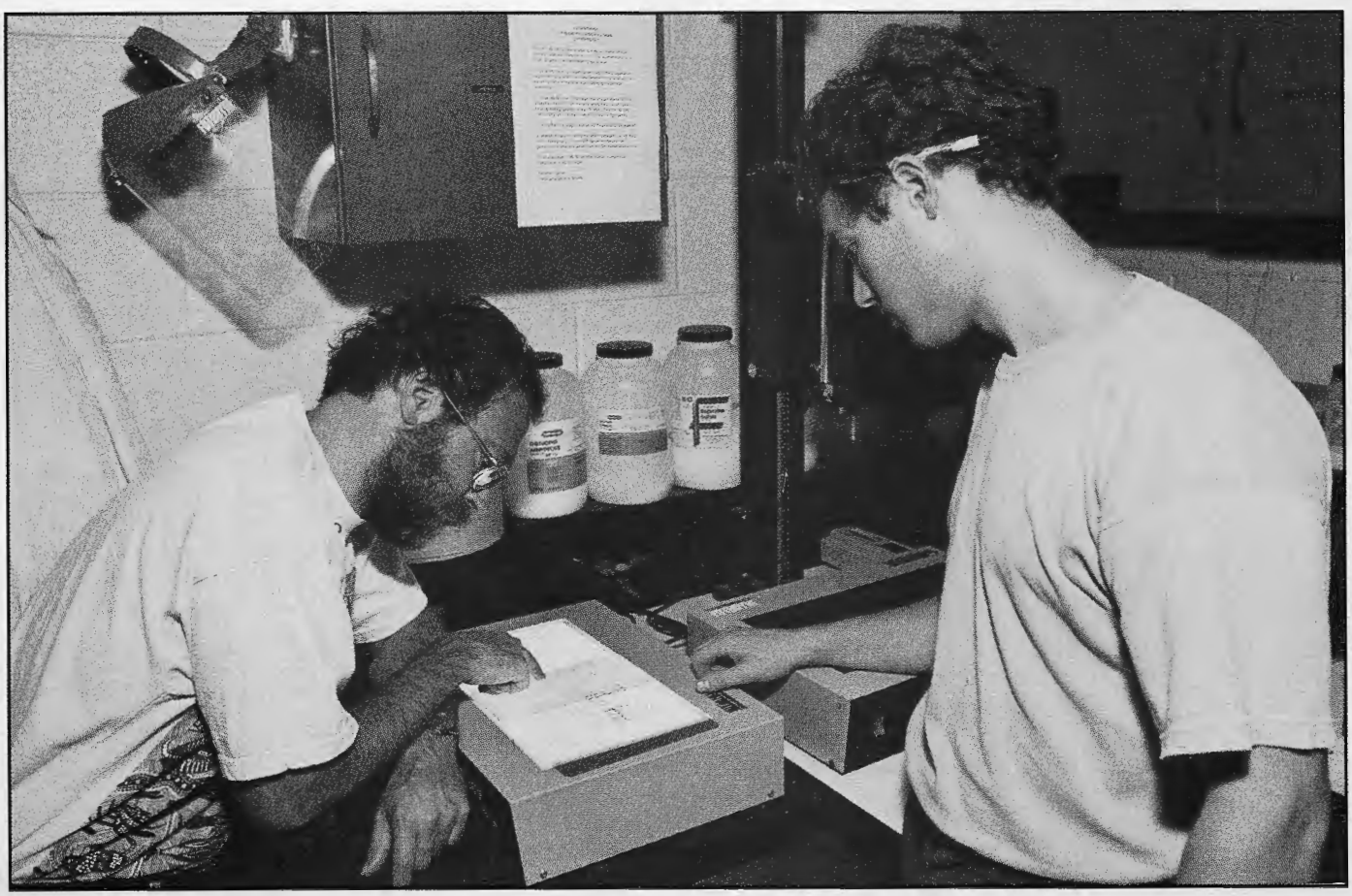
These documents govern both master's and doctoral degree programs. The Manual gives detailed information on responsibilities of major professors and program committees, examination procedures, preparation of theses and dissertations, academic standards, and the Graduate Student Academic Appeals System.

The requirements immediately following are *general requirements* for all graduate students. *Specific requirements* for individual programs are itemized in the section "Graduate Programs."

Program of Study

The purpose of the program of study is to ensure that students, at an early stage in their graduate study, organize coherent, individualized plans for their course work and research activities. It is expected that the successful completion of students' programs of study along with collateral readings, research, etc., will enable them to demonstrate that they have achieved the high level of competence required of graduate students in their respective fields.

All degree candidates are required to prepare a program of study with the guidance of their major professors (for master's degree programs) or of their program committees (for doctoral programs) in accordance with the guidelines in the *Graduate Student Manual.* After the program has been approved by the major professor for master's degree candidates or by the program committee for doctoral candidates, the program of study is submitted for approval to the Dean of the Graduate School.



Course Numbering System

All regular graduate courses are numbered at the 500 and 600 levels. All 900-level courses are special graduate courses for which no graduate program credit is given. Courses numbered at the 400 level are for advanced undergraduates, but may, with approval and to a limited extent, be accepted toward meeting degree requirements at the master's level. For doctoral candidates who have completed the master's degree in the same field or one closely related, all program work must be at the 500 or 600 level.

Scholastic Standing

Graduate work is evaluated by letter grades. All grades earned will remain on the student's record, and unless the courses were approved for no program credit prior to registration, all unacceptable grades will be included in calculating the student's scholastic average.

A grade of C+ (2.33) or lower in courses numbered at the 400 level is considered a failing grade. In such cases of failure the course must either be repeated, if it is a required course, or else replaced by another course approved by the candidate's program committee and the Dean of the Graduate School. When students receive more than one grade of C+ (2.33) or lower in courses at the 400 level, their graduate status is subject to review by the Dean of the Graduate School.

Grades of C- or lower are failing grades in courses at the 500 and 600 levels and require immediate review of the student's status. Students failing these courses must repeat them, if they are required courses, or else they must replace them with courses approved by the candidate's program committee and the Dean of the Graduate School.

The grades S (satisfactory) and U (unsatisfactory) are used for courses of study involving research undertaken for the thesis or dissertation and for certain courses and seminars so designated. The letter I (incomplete) is used for excused unfinished work. Incomplete grades assigned to graduate students may be removed within one calendar year. If the grade of I (incomplete) is not removed within one calendar year, it will remain on the transcript but may not be used for program credit. Grades of S, U, I, and all grades in courses below the 400 level are not included in the academic average.

To qualify for continuation of degree candidate status and for graduation, a cumulative average of B (3.00 on a 4.00 scale) in all work is required, except for courses meeting entrance deficiencies or approved for no program credit prior to registration in the course. At any time when the academic record indicates unsatisfactory performance, the student's status is subject to review. A student who fails to maintain a satisfactory quality point average or to make acceptable progress toward the degree may be dismissed as a graduate student.

Master's Degree Requirements

There are no major or minor area requirements for the master's degree. However, no degree can be awarded for the accumulation of credits without a planned and approved program of study. Courses for the degree are expected to be concentrated in the candidate's field of interest and related areas to produce a well-developed and coherent program.

Requirements for the master's degree must be completed within a period of four calendar years, or within a maximum of seven calendar years with special permission of the department and the Dean of the Graduate School if all of the study is done on a part-time basis. The master's degree may be earned through full- or part-time study, or a combination of the two. Candidates must take at least 80 percent of the credits required for the degree at the University of Rhode Island.

Some departments offer both a thesis and a nonthesis option, while others offer only one plan. Please refer to the "Graduate Programs" section for specific information on each program. The general requirements for these options are as follows.

Thesis Option. The minimum requirements for a master's degree are: 1) the successful completion of 30 credits, including six thesis research credits; 2) at the discretion of the department, the passing of written comprehensive examinations toward the end of the course work; 3) the submission of an acceptable thesis and the passing of an oral examination in defense of the thesis. Four copies of the thesis prepared in accordance with Graduate School requirements must be submitted to the Graduate School Office. A statement on preparation of theses is available from that office.

Nonthesis Option. Depending on departmental requirements, some master's degrees may be earned without a thesis. The minimum requirements for a nonthesis master's degree program are: 1) the successful completion of a minimum of 30 credits; 2) completion of practicums, internships, or other experiences useful to the student's future professional career; 3) registration in one course that requires a substantial paper involving significant independent study; 4) the passing of a written comprehensive examination toward the end of the course work. Some departments may also require a final oral examination.

Research Competency. Although not normally required for the master's degree, a student's major professor or thesis committee may require proficiency in a foreign language, statistics, or computer science where appropriate for the subject chosen.

Professional Degree Requirements

Students should refer to the specific program requirements for professional degrees and consult with the appropriate dean or director.

Doctor of Philosophy Degree Requirements

The Doctor of Philosophy degree must be completed within seven years of the date when the student first enrolled as a candidate.

The requirements for the doctoral degree are: 1) the completion of a minimum of 72 credits of graduate study beyond the baccalaureate degree, of which a minimum of 42 credits must be taken at the University of Rhode Island; 2) the passing of a qualifying examination; 3) if required by the department, proficiency in one or more foreign languages and/or in an approved research tool; 4) the passing of a comprehensive examination; 5) the

651 International Marketing Management *(I and II, 3)* Marketing policy making for the multinational firm; organizing for international marketing; its opportunities, pricing, channels, promotion, and research. *(Lec. 3) Pre: 601 or permission of instructor.* Staff

661 Product Management *(I or II, 3)* Development of product policies and strategies. Emphasis on organizing the marketing function to deal with various product-related activities including new product development, life cycle strategies, and product deletion. *(Lec. 3) Pre: 601 or permission of instructor.* Staff

691, 692 Directed Study in Marketing *(I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

693, 694 Internship in Marketing *(I and II, 3 each)* Participation in management and/or problem solving under the supervision and guidance of a sponsoring agency with evaluation by the College of Business Administration. *(Practicum) Pre: proposal acceptance by College of Business Administration, no previous internship credit, and graduate standing. S/U credit.* Staff

695, 696 Seminar in Marketing *(I and II, 3 each)* Preparation and presentation of papers on selected topics in marketing. *(Seminar) Pre: 601 or permission of instructor.* Staff

697 Doctoral Research Seminar *(I and II, 3)* Provides a rigorous analysis of current research questions and research techniques used to address those questions in the academic discipline. Recent developments and current issues addressed. *(Seminar) Pre: enrollment in Phase II of the Ph.D. program in business administration.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) Pre: enrollment in Phase III of the Ph.D. program in business administration. S/U credit.*

OMT Courses
Operations Management

458 Integrated Production: Logistics Systems *(II, 3)*

460 Management of Quality Control: Computer Applications *(I, 3)*

640 Production and Operations Management *(I and II, 2)* The management of manufacturing and service operations. Topics include: flow processes, inventories, scheduling, capacity, and operations strategy. *(Lec. 2 for one-half semester, second half) Pre: QBA 530.* Staff

650 Management of Computer-Integrated Manufacturing Systems *(II, 3)* This readings-based seminar explores various aspects of CIM through a managerial framework. It will integrate the design, planning, and execution areas of manufacturing using a CIM-based strategy. *(Seminar) Pre: 640.* Mangiameli

681 Operations Management in Service Organizations *(I or II, 3)* Problems facing operations managers of service organizations are examined. Topics include: flows through services systems, forecasting service demand, capacity planning for service organizations, and scheduling service operations. *(Lec. 3) Pre: 640.* Staff

QBA Courses
Quantitative Business Analysis

500 Computing for Management *(I and II, 2)* Computer concepts and programming in a high-level language such as BASIC, FORTRAN, or PASCAL. Emphasis on computing as an administrative and analytical tool for applications in management. Includes use of software packages. *(Lec. 2 for one-half semester, first half) Graduate credit for non-M.B.A. students only if MIS 600 is completed.* Staff

520 Mathematical Methods for Management *(I and II, 3)* Fundamental mathematical methods applied to the understanding and solution of managerial problems. Topics include the solution of systems of linear equations, differential calculus, and related areas. *(Lec. 3) Graduate credit for matriculated M.B.A. and M.S. in accounting students only.* Staff

530 Statistical Methods for Management *(I and II, 3)* Introductory methods of statistics applied to the understanding and solution of business problems. Topics include concepts of business-decision parameters, classical and subjective probability, probability distribution, inference, sample-size problems, regression, and index numbers. *(Lec. 3) Graduate credit for matriculated M.B.A. and M.S. in accounting students only.* Staff

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Chemical Engineering

M.S., Ph.D.
401-792-2655

Graduate Faculty

Chairperson: Professor Stanley M. Barnett, Ph.D., 1963, University of Pennsylvania
Director of Graduate Studies: Assistant Professor Mercedes Rivero-Hudec, Ph.D., 1986, University of Pennsylvania
Professor Arijit Bose, Ph.D., 1981, University of Rochester
Professor Richard Brown, Ph.D., 1977, University of Cambridge
Professor Joseph Estrin, Ph.D., 1960, Columbia University
Professor Otto Gregory, Ph.D., 1982, Brown University
Professor Harold N. Knickle, Ph.D., 1969, Rensselaer Polytechnic Institute
Professor Thomas J. Rockett, Ph.D., 1963, Ohio State University
Professor Vincent C. Rose, Ph.D., 1964, University of Missouri
Associate Professor Donald J. Gray, Ph.D., 1980, University of Rhode Island
Adjunct Assistant Professor Everett Crisman, Ph.D., 1984, Brown University

Specializations

Biochemical engineering: reactors, purification methods, degradation, and chemical production.

Environmental engineering: separation methods, heavy metal removal, hazardous waste minimization, and desalination.

Food engineering: membrane processes.

Materials engineering: corrosion and erosion, electronic materials processing, ceramic processing polymer films, conducting polymers and phase equilibria.

Transport phenomena: crystal growth, nucleation from solution, interfacial and colloidal phenomena, filtration, flow through porous media, multiphase fluid mechanics, and diffusion through polymers.

Energy engineering: analysis of energy systems, multiphase flow and coal liquefaction.

Unit operations: crystallization, mixing, chromatography, electrodialysis, ultrafiltration and microfiltration.

Master of Science

Admission requirements: bachelor's degree in chemical engineering; candidates from other engineering fields or from mathematics, biology, chemistry, or physics may be accepted into the program with possible addition of prerequisite courses.

Program requirements: thesis option—CHE 501, 502. Nonthesis option for part-time students, with permission of the chairperson; master's examination and comprehensive report with oral examination.

Doctor of Philosophy

Admission requirements: M.S. degree in engineering (may be waived for University of Rhode Island graduate students who pass qualifying examination with superior performance).

Program requirements: candidate's program will be determined in consultation with his or her committee and will be based on his or her background and career goals. A comprehensive examination is required to complete the program. There is no general language requirement, but a student's committee may require a foreign language or research tool that may be necessary for the candidate's program. In addition to an acceptable dissertation, a candidate must submit a manuscript, based on his or her research, suitable for publication in a technical journal. CHE 501, 502 is also required.

MIS Courses
Management Information Systems

483 Business Applications Programming *(I, 3)*
484 Management Systems Analysis and Design *(II, 3)*
485 Management of Databases *(I, 3)*
486 Advanced Programming and Information Structures *(I, II, or SS, 3)*
488 Business Software Development Project *(II, 3)*

600 Information System Concepts *(I and II, 2)* Concepts, procedures, and managerial issues dealing with information and decision-support systems. Topics include hardware and software; business systems; systems analysis, design, and implementation. *(Lec. 2 for one-half semester, second half) Pre: QBA 500, 520, 530 or equivalent.* Staff

605 Business Microcomputer Applications *(I, 3)* Microcomputer technology and applications in business. Hardware, software, selection of microcomputer systems, and use of commercial software packages. Student projects and microcomputer laboratory sessions required. *(Lec. 3) Pre: 600.* Staff

664 Health Information Systems *(I or II, 3)* Concepts associated with the design, implementation, management, and evaluation of administrative and clinical health information systems. *(Lec. 3) Pre: QBA 500 or equivalent or permission of instructor.* Armstrong, Koza, and Humphrey

MGS Courses
Management Science

445 Managerial Applications of Simulation *(II, 3)*
450 Forecasting: Computer Applications *(I or II, 3)*
465 Advanced Topics in Management Science: Deterministic Models *(II, 3)*
466 Advanced Topics in Management Science: Probabilistic Models *(II, 3)*
470 Advanced Managerial Support Systems *(II, 3)*
475 Bayesian Statistics in Business *(I, 3)*

601, 602 Advanced Management Statistics *(I and II, 3 each)* Theory and application of regression and correlation analysis, analysis of variance and experimental design, and other multivariate data analyses. *(Lec. 3) Pre: QBA 530 or waiver examination.* Staff

620 Quantitative Methods for Management *(I and II, 2–3)* Survey of principal operations research/management science models. Linear programming, network, and other mathematical programming models; simulation, decision analysis, and other probabilistic models. *(Lec. 2 for one-half semester, first half) Pre: QBA 500, 520, and 530 or waiver examinations.* Staff

630 Management Statistics with SAS and Personal Computer Software *(II, 3)* Second course in statistical analysis for MBA students. Introduces SAS computer languages and personal software. Regression, business experimental designs, time series, business index numbers, decision theory. *(Lec. 3) Pre: QBA 500, 520, and 530 or waiver examinations.* Staff

671 Methods of Business Research *(I and II, 3)* An understanding of research methodology and the culmination of such methodology into a term project. *(Lec. 3) Pre: QBA 530 or equivalent and permission of chairperson.* Staff

674 Business Research Methods: Applied Multivariate Methods *(I and II, 3)* Introduction to multivariate analysis in business with emphasis on applications. *(Lec. 3) Pre: QBA 520, 530, MIS 601, or permission of instructor.* Staff

675 Applied Time Series Methods and Business Forecasting *(I and II, 3)* Study of time-series methods. Construction and use of Autoregressive Integrated Moving Averages (ARIMA) forecasting models. Applications to strategic decision actions. *(Lec. 3) Pre: QBA 520, 530, MIS 601, or permission of instructor.* Staff

676 Applied Econometric Methods in Business *(I and II, 3)* Design and construction of large-scale multiequation models to explain and predict behavior in management, production, finance, and marketing. *(Lec. 3) Pre: ECN 590, MGS 601, or permission of instructor.* Staff

683 Business Decision Theory *(I or II, 3)* A statistical analysis of managerial decision making under uncertainty. Bayesian statistical inference and subjective probability are stressed. Comparisons between Bayesian method and classical statistics are discussed, and applications to business problems are emphasized. *(Lec. 3) Pre: QBA 520, 530, or equivalent.* Staff

684 Advanced Mathematical Programming Methods in Management *(II, 3)* Introduction to integer, nonlinear, and dynamic programming. Emphasis on application of modern mathematical optimization techniques in single-stage and multiple-stage management decision problems. *(Lec. 3) Pre: QBA 500, 520, 530, or waiver examinations and MGS 620.* Staff

691, 692 Directed Study in Management Science *(I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

693, 694 Internship in Management Science *(I and II, 3 each)* Participation in management and/or problem solving under the supervision and guidance of a sponsoring agency with evaluation by the College of Business Administration. *(Independent Study) Pre: proposal acceptance by College of Business Administration, no previous internship credit, and graduate standing. S/U credit.* Staff

695 Seminar in Management Science *(I or II, 3)* Preparation and presentation of papers on selected topics in management science. *(Seminar) Pre: 620.* Staff

697 Doctoral Research Seminar *(I and II, 3)* Provides a rigorous analysis of current research questions and research techniques used to address those questions in the academic discipline. Recent developments and current issues addressed. *(Seminar) Pre: enrollment in Phase II of the Ph.D. program in business administration.* Staff

MKT Courses
Marketing

***405 Marketing Communications** *(I, 3)*
***406 Product Management** *(I, 3)*
***407 Channels of Distribution** *(II, 3)*
***408 Pricing Decisions** *(II, 3)*
***409 Marketing Policy and Problems** *(II, 3)*
***415 Marketing Research** *(I and II, 3)*
416 Marketing Research Applications *(II, 3)*
***434 Advertising Strategy and Management** *(II, 3)*
442 Sales Management *(II, 3)*
445 Direct Marketing *(I and II, 3)*
446 Industrial Marketing *(I, 3)*
***451 International Marketing** *(II, 3)*
***491, 492 Directed Study** *(I and II, 1–3 each)*

501 Marketing Theory and Practice *(I and II, 2)* Analytical approach to contemporary theory and practice of marketing management. *(Lec. 2) Not open to M.B.A. students.* Staff

601 Managerial Marketing *(I, 4)* Analysis of marketing problems and determination of marketing policies in product development, promotion, pricing, channel selection; legal aspects. *(Lec. 4) Pre: ECN 590, QBA 520 and 530, or equivalent, or permission of instructor.* Staff

611 Buyer Behavior *(I or II, 3)* Analysis of major factors influencing the behavior and demand of consumers. Emphasis on using these factors to identify and segment target markets and to assess the effects of these factors on markets. *(Lec. 3) Pre: 601 or permission of instructor.* Staff

615 Marketing Research *(I or II, 3)* Marketing information needs and appropriate means of providing the requisite information are analyzed. Several major marketing decision areas and their research implications are examined in depth. *(Lec. 3) Pre: 601, QBA 520 and 530, ECN 590, or permission of instructor.* Staff

631 Advertising Management *(I or II, 3)* A course oriented toward managers responsible for planning, appraising, and administering advertising and promotion activities. *(Lec. 3) Pre: 601 or permission of instructor.* Staff

* These courses may not be taken for graduate credit by students in the College of Business Administration.

660 Managerial Economics *(I and II, 3)* The applications of economic theory and methodology to business problems. *(Lec. 3) Pre: 601, MIS 600, 620, and OMT 640.* Staff

671 Seminar in Finance *(I or II, 3)* Independent research. Individual topics based on readings and research interests of the students. *(Seminar) Pre: 601.* Staff

691, 692 Directed Study in Finance *(I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

693 Internship in Finance *(I and II, 3)* Participation in management and/or problem solving under the supervision and guidance of a sponsoring agency with evaluation by the College of Business Administration. *(Practicum) Pre: proposal acceptance by College of Business Administration, no previous internship credit, and graduate standing. S/U credit.* Staff

697 Doctoral Research Seminar *(I and II, 3)* Provides a rigorous analysis of current research questions and research techniques used to address those questions in the academic discipline. Recent developments and current issues addressed. *(Seminar) Pre: enrollment in Phase II of the Ph.D. program in business administration.* Staff

INS Courses
Insurance

414 Commercial Property and Liability Insurance *(I or II, 3)*
433 Social Insurance *(I or II, 3)*
471 Topics in Insurance *(I or II, 3)*

691, 692 Directed Study in Insurance *(I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

MGT Courses
Management

402 Leadership and Motivation *(I or II, 3)*
407 Organization and Management Theory II *(I and II, 3)*
408 Organization Development and Change *(I or II, 3)*
422 Labor Law and Legislation *(II, 3)*
431 Advanced Management Seminar *(I or II, 3)*
480 Small Business Management *(I, 3)*
482 Entrepreneurship *(II, 3)*

530 Management Theory and Practice *(II, 2)* Management applied to business; objectives, policies, organizational staffing, and control; production; personnel; behavioral science applications; the role of quantitative methods. *(Lec. 2)* Staff

626 Organizational Behavior *(I, 3)* Incorporates the insights gleaned from the disciplines of psychology, sociology, anthropology, and the social sciences of politics, economics, and history in the study of the behavior of organizations and of their principal actors. *(Lec. 3) Pre: 630 or equivalent.* Staff

627 Advanced Organizational Theory and Behavior *(II, 3)* Previous knowledge of classical and traditional management thought used to provide concepts, analytical approaches, and skills for understanding how behavioral sciences influence complex organizational systems. *(Lec. 3) Pre: 626.* Staff

630 Organizational Theory and Behavior *(I and II, 4)* Management applied to business objectives, policies, organizational staffing and control. Interpersonal dynamics in organizational settings. Role of human resource management. Emphasis on individual and structural factors affecting decision making. *(Lec. 4) Pre: graduate standing.* Staff

635 Consulting and Management Practice *(I or II, 3)* Review of the theory and practice of effective consulting and development of consultation skills. *(Practicum) Pre: 630 or permission of instructor.* Coates

638 Seminar in Management *(I or II, 3)* Class discussion of typical cases, original research work in the field of management with discussion of data collected and analyzed by individual students. *(Seminar) Pre: permission of chairperson.* Staff

639 Advanced Topics in Management *(I or II, 3)* Integrated approach to problems in major areas of business management with emphasis on administrative and executive viewpoint. *(Seminar) Pre: permission of chairperson.* Staff

640 Compensation Administration *(I or II, 3)* Compensation and performance appraisal systems. Theory and techniques used to determine job worth. Special issues in compensation management, such as relating pay to performance through appraisal techniques and pay compression. *(Lec. 3) Pre: 630.* Staff

641 Human Resource Development *(I or II, 3)* Techniques used in procurement and development of human resource. Planning through recruitment, selection, and placement to training and development. Integration of HRD process with organizational strategic plans. *(Lec. 3) Pre: 630.* Staff

655 International Business Management *(I, 3)* Examines the problems and characteristics of international management by focusing on the role of the multinational corporation in a cross-cultural setting. *(Lec. 3) Pre: 630 or equivalent.* Staff

656 Japanese Business Systems *(I or II, 3)* A comparative study of Japanese business management systems by means of readings, case studies, and lectures. Focus on management practices in Japanese firms and problems of coping with environmental factors in Japan and the United States. *(Lec. 3) Pre: 630 or permission of instructor.* Coates

657 International Comparative Management and Culture *(I or II, 3)* An interdisciplinary course which examines the effects of culture on managerial behavior and decision making. *(Lec. 3) Pre: 630.* Coates

670 Business Environmental Analysis *(II, 3)* Advanced analysis of increasingly complex interrelationships between the business organization and its environment. Emphasis on conceptual foundations of business and the impact of contemporary sociopolitical issues on management decision making. *(Lec. 3) Pre: 630 or permission of chairperson.* Staff

681 Administrative Policy and Decision Making *(I and II, 3)* Case studies of management problems and evaluation of alternative solutions by integrating functional areas of business. Discussion of ethical, social, and regulatory environments in domestic and multinational firms. Includes the M.B.A. written comprehensive examination. *(Lec. 3) Pre: all M.B.A. 500-level first-tier courses or equivalent and a minimum of 21 M.B.A. credits which must include MGT 630, MKT 601, FIN 601, ACC 610, or permission of instructor.* Staff

691, 692 Directed Study in Management *I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

693, 694 Internship in Management *(I and II, 3 each)* Participation in management and/or problem solving under the supervision and guidance of a sponsoring agency with evaluation by the College of Business Administration. *(Practicum) Pre: proposal acceptance by the College of Business Administration, no previous internship credit, and graduate standing. S/U credit.* Staff

695 Managerial Skills Development *(I, II, and SS, 3)* Assessment, feedback, and development of managerial skills; leadership, group decision making and problem solving, negotiation, making presentations, giving feedback, listening. *(Lec. 3) Pre: 630.* Staff

696 Strategic Decision Making *(I, II, and SS, 3)* Development of the skills and competencies in strategic thinking; use of critical analysis in the diagnosis of organizational and management problems. Serves as foundation for policy course and case method. *(Lec. 3) Pre: graduate standing.* deLodzia

697 Doctoral Research Seminar *(I and II, 3)* Provides a rigorous analysis of current research questions and research techniques used to address those questions in the academic discipline. Recent developments and current issues addressed. *(Seminar) Pre: enrollment in Phase II of the Ph.D. program in business administration.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) Pre: enrollment in Phase III of the Ph.D. program in business administration. S/U credit*

Applicants for whom English is not the native language will be expected to score 575 or above on the TOEFL. The GMAT and GRE scores and master's quality point average are not the sole criteria for admission. However, those with master's quality point averages of less than 3.20 on a 4.00 point scale or those who score lower than the 60th percentile on the GMAT or GRE have a low probability of admission. The average master's quality point average for current doctoral candidates is 3.60, and their GMAT scores average in the top 20th percentile.

Program requirements: During the qualifying phase of the program, entering doctoral students must take four written qualifying examinations. These written examinations are scheduled in accounting, financial economics, behavioral science, and decision science. One or more of these examinations may be waived for a student on the basis of course work taken in the last five years.

The advanced study phase includes a minimum of 32 credit hours of advanced course work in the area of specialization, in supporting and connected areas, and in research methodology and techniques. Course work during this phase may include seminars, directed studies, research projects, and field work deemed appropriate for the student's area of specialization. All Ph.D. candidates must include BUS 601 and 602 in their programs of study. Each student is required to write at least three major papers of publishable quality. This phase culminates in a written comprehensive examination covering the student's area of specialization as well as research methods and statistics.

After passing the comprehensive examination, doctoral candidates enter the dissertation research phase and engage in significant research under the supervision of their major professor and the doctoral committee. Doctoral dissertation research is expected to make a major contribution to the state of knowledge in the candidate's field. The dissertation defense is a final oral examination administered according to procedures established by the Graduate School.

The Department of Management Science and Information Systems is also a sponsor of the Ph.D. program in applied mathematical sciences (see page 30).

General Information

In addition to the University's Academic Computer Center, business students have access to four other computer facilities: the Dennis W. Callaghan Microcomputer Laboratory, the Computer-Integrated Manufacturing Laboratory, the college's general computer facility, and a smaller computer laboratory at the College of Continuing Education (see page 7). These facilities are available to both daytime and evening students six days a week.

ACC Courses

See listing under Accounting, page 28.

BUS Courses
Ph.D. in Business Administration

601 Practicum in Business *(I, 1)* Course involves training and experience in teaching undergraduate business courses under the supervision of a full-time faculty member. Participation in the instructional development program is an essential component of the class. *(Practicum) Pre: enrollment in Ph.D. program in business administration and permission of Ph.D. program director.* Staff

602 Doctoral Colloquium in Business Administration *(II, 1)* Course involves presenting the results of at least one piece of original research to faculty and other Ph.D. candidates. When not presenting, students are expected to play an active role in critiquing the presented research. *(Lec. 1) Pre: permission of Ph.D. program director.* Staff

685 Knowledge Systems in Managerial Disciplines *(I or II, 3)* Examination of knowledge production and dissemination systems in management disciplines. Discussion of various paradigms and philosophy of science perspectives. Metascientific and research program issues are examined. *(Seminar) Pre: Ph.D. candidate.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) Pre: enrollment in Phase III of the Ph.D. program in business administration. S/U credit.*

BSL Courses
Business Law

442 Property Interests *(II, 3)*
450 Consumer Law and Legislation *(I, 3)*
460 Law and the Entrepreneur *(II, 3)*

501 Law and Accounting *(II, 3)* Introduction to CPA law exam, question and answer techniques, coverage of most accounting- related legal subjects currently included on the CPA exam. *(Lec. 3) Pre: 600 or permission of chairperson.* Hickox

600 Legal Environment of Business *(I and II, 3)* Coverage includes both substantive and procedural rules of law in the civil and administrative law field with emphasis on business, regulation, societal, and ethical issues. *(Lec. 3) Pre: graduate standing.* Staff

691 Directed Study in Business Law *(I and II, 1–3)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

FIN Courses
Finance

***401 Advanced Financial Management** *(I or II, 3)*
420 Speculative Markets *(I or II, 3)*
***425 Portfolio Theory and Management** *(I or II, 3)*
***433 Bank Financial Management** *(I or II, 3)*
***452 Multinational Finance** *(I or II, 3)*

601 Financial Management *(I and II, 4)* Functions and responsibilities of financial managers. Examination of financial issues, both internal to the firm and arising from interaction with the financial system. Financial statement analysis, structure, valuation, markets, capital budgeting, working capital. *(Lec. 4) Pre: ACC 610, ECN 590, QBA 520 and 530.* Staff

602 Advanced Financial Management *(I or II, 3)* Case studies and selected readings emphasizing the application of financial theory and analytical techniques to financial management. *(Lec. 3) Pre: 601 or equivalent.* Staff

622 Security and Investment Analysis *(I or II, 3)* Analysis of the problems of investing funds and managing investments. Use of the latest investment theories and their implementation via quantitative techniques will be explored. *(Lec. 3) Pre: 601 or equivalent.* Staff

625 Advanced Portfolio Theory and Security Analysis *(I or II, 3)* An examination of advanced theories and practices in portfolio building and maintenance. Issues related to security price behavior are also examined. *(Seminar) Pre: 601 or equivalent.* Staff

633 Depository Institutions and Financial Management *(I or II, 3)* Study of the financial decisions facing the management of depository institutions. Current financial practices and problems explored. Models for bank managers will be considered. *(Lec. 3) Pre: 601 or equivalent.* Staff

641 Advanced Financial Theory *(I or II, 3)* Analysis of the theoretical framework for corporate decision making related to financial planning, capital budgeting decisions, dividend policy, and capital structure decisions. Emphasis on current research developments. *(Seminar) Pre: 601 or equivalent.* Staff

652 Advanced International Financial Management *(I or II, 3)* Analysis of issues relevant to the international financial manager. The financial operations of multinational enterprises are examined through both the theoretical and case approach. *(Seminar) Pre: 601 or equivalent.* Staff

* These courses may not be taken for graduate credit by students in the College of Business Administration.

Professor M. Ven Venkatesan, Ph.D., 1965, University of Minnesota
Associate Professor Carol F. Surprenant, Ph.D., 1981, University of Wisconsin
Assistant Professor Bari Harlam, Ph.D., 1991, University of Pennsylvania
Assistant Professor Kapil Jain, Ph.D., 1990, Columbia University
Assistant Professor Deborah Rosen, Ph.D., 1992, University of Tennessee

Specializations

For the M.B.A.: finance, general management, international management, management science, and marketing.

For the Ph.D.: finance, management, management science, and marketing.

Master of Business Administration

The Master of Business Administration (M.B.A.) program prepares students for leadership positions in business, government, and nonprofit organizations. The faculty seeks to develop a global perspective while stressing the ethical and environmental responsibilities inherent in all management activities. The program is offered on the Kingston Campus for full-time and part-time students, and in the evening through the College of Continuing Education in Providence for part-time students. Candidates may begin the program in September or January.

In addition, an M.B.A. for Executives may be completed in 22 months by participating in a program that meets on Fridays and Saturdays at the W. Alton Jones Campus. A group of 20–25 experienced managers (7–10 years of management experience) follows a curriculum that emphasizes computer applications, human relations, organizational behavior, financial analysis, and other areas useful to the effective manager. Applications should specify the M.B.A. program and indicate on which campus study is to be undertaken.

Admission requirements: Graduate Management Admissions Test (GMAT), a statement of purpose, a resumé, three letters of recommendation, and transcripts of all previous undergraduate or postbaccalaureate work are required. Work experience is valued. Applicants for whom English is not the native language will be expected to score 575 or above on the TOEFL. The GMAT score and undergraduate quality point average are not the sole criteria for admission. However, those with undergraduate quality point averages of less than B or those with less than 50th percentile scores on the GMAT have a low probability of admission. Applications from well-qualified individuals who can contribute to the cultural and ethnic diversity of the College of Business Administration and of the University are welcome.

Program requirements: nonthesis program requires a minimum of 36 credits and a maximum of 54 credits. Of these, 11 credits are designated entry-level courses: ECN 590, QBA 500, 520, and 530. QBA 500, 520, and 530 may be waived upon successful completion of proficiency examinations administered by the Department of Management Science and Information Systems. These courses may also be waived with permission of the chairperson and program director based on recent successful completion of equivalent college-level courses at an AACSB-accredited institution. ECN 590 may also be waived based on recent completion of college-level courses in micro- and macroeconomics with grades of B or better. If QBA 520 or 530 is waived, the student must take an elective in place of the waived course. If ECN 590 is waived, the program is reduced by three credits. The 43-credit standard program is composed of 31 credits of required courses: ACC 610; BSL 600; FIN 601, 660; MGT 630, 681; MIS 600; MGS 620; MKT 601; OMT 640; plus 12 credits of electives. Of the required courses, the following may be waived (with the recommendation of the appropriate chairperson and the M.B.A. program director, and the approval of the Dean of the Graduate School) based on significant prior college-level study in the appropriate field (usually multiple courses in the field from an AACSB-accredited program): ACC 610; BSL 600; MGS 620; MGT 630; MIS 600; MKT 601; and OMT 640. Of the 12–18 elective credits, no more than nine may be required in a single field of specialization. Students who do not wish to specialize may choose their electives with the prior approval of the M.B.A. program director and the Dean of the Graduate School.

For the specializations listed here, the courses indicated are either required or recommended, *in addition to the required M.B.A. courses*. Other electives may be used to complement the required courses, but such choices are subject to approval by the M.B.A. program director.

Students are encouraged to participate in internships, which include both practical and academic components. Arrangements must be made through an academic advisor and must include registration in the appropriate course; e.g., MGT 693, 694 Internship in Management. Placements may be arranged through various external organizations.

Finance (Coordinator: Professor Gene C. Lai). Students choose electives that emphasize corporate finance, investment management, international finance, speculative markets, or financial institutions. Requirements: FIN 641 and two electives chosen from FIN courses and ECN 538.

General Management (Coordinator: Professor Clay V. Sink). Students go beyond the core management courses and study areas such as organizational behavior, theory, and development; human relations; labor relations; entrepreneurship; strategic management; and business law. Requirements: three electives selected from MGT or BSL courses, LRS 541, 542 or 543 (not both), and LRS 545.

International Management (Coordinator: Professor Norman Coates). Students study the problems and processes of managing organizations in an interdependent, global environment. Requirements: three electives selected from MGT 655, 656, and 657; MKT 651; FIN 652; LRS/PSC 521; and ECN 538. Students are encouraged to take supplemental interdisciplinary courses in the historical, cultural, social, political, economic, or linguistic differences in management. Those with appropriate levels of second-language proficiency are encouraged to take a business language course.

Management Science (Coordinator: Professor Russell C. Koza). Students study the applications of mathematics, statistics, and computer systems to the management of organizations, along with the function of production and operations management. Requirements: three MIS, MGS, or OMT electives, which may be augmented with courses in computer science, engineering, and mathematics with approval of the program coordinator.

Marketing (Coordinator: Professor Albert Della Bitta). Students study essential elements of marketing beyond the fundamentals covered in the core marketing course. Electives are chosen from course offerings.

All 600-level courses offered by departments in the College of Business Administration are open to matriculated graduate students only.

Doctor of Philosophy

The Doctor of Philosophy program is small and highly selective. Admission is competitive and based on academic merit, research capabilities, and the match of research interests between the applicant and faculty in the indicated area of specialization.

Admission requirements: GMAT or GRE, and a master's degree. Applicants with diverse academic backgrounds are encouraged to apply.

Applicants are admitted for September only. Due to limited resources, new admissions to the doctoral program must be limited to a small number each year. Since applicants are evaluated for each of the four specialization areas independently, all applicants must specify a single area of specialization on the application form. Completed application package must be received by March 1; applications completed after that date are reviewed on a space-available basis until the programs are full, and are not guaranteed a full review.

554 Cytogenetics *(I, 4)* Comparisons of various types of crossing-over, chromosomal abberations and their effects, mutation, and other cytogenetic pheonomena in fungi and higher organisms. Laboratory studies of meiosis in maize, identification of chromosomes, and induced rearrangements. *(Lec. 2, Lab. 4) Pre: 352, 453, or permission of instructor.* Mottinger

562 Seminar in Plant Ecology *(II, 2)* Recent topics and investigations pertinent to plant ecology. Library research, oral presentation of reports, and group discussions. *(Seminar) Pre: 262 (or ZOO 262) or equivalent or permission of instructor. May be repeated.* Killingbeck

579 Advanced Genetics Seminar
See Zoology 579.

581, 582 Botany Seminar *(I and II, 1 each)* Preparation and presentation of papers on subjects in selected areas relating to botany. Required of graduate students majoring in botany. *(Seminar) S/U credit.* Staff

590 Botanical Techniques *(I, 1)* Current research techniques in the botanical sciences. Includes short-term participation in several ongoing research programs and an overnight, weekend field trip. *(Lab. 3) Pre: graduate standing or permission of instructor.* Staff

591, 592 Botanical Problems *(I and II, 1–3 each)* Special work arranged to meet the needs of individual students who are prepared for and desire advanced work in botany. *(Independent Study) Offered only by arrangement with staff.* Staff

593 Special Topics *(I and II, 1–3)* Covers the following specialized areas of botany: a) recent advances in mycology, b) physiological ecology of marine macroalgae, c) nutrient ecology of plants, and d) ecology of fungi. *(Independent Study) Pre: permission of instructor. May be repeated for a maximum of 9 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

661 Phytoplankton Taxonomy
See Oceanography 661.

663 Phytoplankton Physiology
See Oceanography 663.

664 Phytoplankton Ecology
See Oceanography 664.

667 Advanced Phytoplankton Seminar
See Oceanography 667.

691, 692 Botanical Problems *(I and II, 1–6 each)* Special work to meet the needs of individual students who are prepared to undertake special problems. *(Independent Study) Pre: permission of chairperson.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Botany Topics for Teachers *(I and II, 0–3 each)* Especially designed for teachers of biology. Basic topics of botany from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Staff

Business Administration

M.B.A., Ph.D.
401-792-5000

Graduate Faculty

Interim Dean, College of Business Administration: Frank S. Budnick, D.B.A, 1973, University of Maryland
Director of Graduate Programs: Professor Richard W. Scholl, Ph.D., 1979, University of California, Irvine
Director of Ph.D. Program: Associate Professor Laura L. Beauvais, Ph.D., 1987, University of Tennessee

Accounting
Chairperson: Professor Henry R. Schwarzbach, D.B.A., 1976, University of Colorado; C.P.A.
Professor Spencer J. Martin, Ph.D., 1970, University of Illinois; C.P.A.
Professor Joseph P. Matoney, Jr., Ph.D., 1973, Pennsylvania State University; C.P.A. (Rhode Island)
Professor Richard Vangermeersch, Ph.D., 1970, University of Florida; C.P.A. (Rhode Island)
Associate Professor Edmund J. Boyle, Ph.D., 1990, Pennsylvania State University; C.P.A.
Associate Professor Marshall A. Geiger, Ph.D., 1988, Pennsylvania State University; C.P.A.
Associate Professor Mark Higgins, Ph.D., 1989, University of Tennessee; C.P.A.
Assistant Professor Judy K. Beckman, Ph.D., 1991, Texas Tech University; C.P.A.
Assistant Professor Alejandro Hazera, D.B.A., 1989, University of Kentucky; C.P.A.

Business Law
Professor Andrew Laviano, J.D., 1965, New York University School of Law
Associate Professor John Dunn, J.D., 1977, Boston College Law School
Associate Professor Charles Hickox, L.L.M., 1994, Boston University

Finance and Insurance
Chairperson: Associate Professor Gordon H. Dash, Jr., D.B.A., 1978, University of Colorado
Professor Dennis W. McLeavey, D.B.A., 1972, Indiana University; C.F.A.
Professor S. Ghon Rhee, Ph.D., 1978, Ohio State University
Associate Professor Rosita P. Chang, Ph.D., 1982, University of Pittsburgh
Associate Professor Gene C. Lai, Ph.D., 1987, University of Texas, Austin
Associate Professor Blair M. Lord, Ph.D., 1975, University of California
Associate Professor Henry R. Oppenheimer, Ph.D., 1979, Purdue University
Assistant Professor Jun-Koo Kang, Ph.D., 1991, Ohio State University
Assistant Professor Yul Lee, Ph.D., 1986, University of Texas, Austin

Management
Chairperson: Professor Clay V. Sink, Ph.D., 1968, Ohio State University; C.A.M.
Professor Norman Coates, Ph.D., 1967, Cornell University
Professor Robert A. Comerford, Ph.D., 1976, University of Massachusetts
Professor George deLodzia, Ph.D., 1969, Syracuse University
Professor Craig E. Overton, Ph.D., 1971, University of Massachusetts
Professor Charles T. Schmidt, Jr., Ph.D., 1968, Michigan State University
Professor Richard W. Scholl, Ph.D., 1979, University of California, Irvine
Associate Professor Laura L. Beauvais, Ph.D., 1987, University of Tennessee
Associate Professor Elizabeth A. Cooper, Ph.D., 1985, University of Akron
Associate Professor Diane M. Disney, Ph.D., 1988, Brandeis University
Assistant Professor Sanjiv Dugal, Ph.D., 1991, University of Massachusetts
Assistant Professor Linda M. Randall, Ph.D., 1993, University of Massachusetts

Management Science and Information Systems
Chairperson: Professor Maling Ebrahimpour, Ph.D., 1986, University of Nebraska
Professor Charles P. Armstrong, Ph.D., 1973, University of Arizona
Professor Alan B. Humphrey, Ph.D., 1965, North Carolina State University
Professor Jeffrey E. Jarrett, Ph.D., 1967, New York University
Professor Chai Kim, Ph.D., 1973, University of Pittsburgh
Professor Russell C. Koza, Ph.D., 1968, Rensselaer Polytechnic Institute
Professor Paul M. Mangiameli, Ph.D., 1979, Ohio State University
Professor Richard Mojena, Ph.D., 1971, University of Cincinnati
Professor Seetharama Narasimhan, Ph.D., 1973, Ohio State University
Associate Professor Roy Ageloff, Ph.D., 1975, University of Massachusetts
Associate Professor Shaw K. Chen, Ph.D., 1988, University of Michigan
Associate Professor Stuart Westin, Ph.D., 1983, University of Massachusetts

Marketing
Chairperson: Professor Albert J. Della Bitta, Ph.D., 1971, University of Massachusetts
Professor Nikhilesh Dholakia, Ph.D., 1975, Northwestern University
Professor Ruby Roy Dholakia, Ph.D., 1976, Northwestern University
Professor Eugene M. Johnson, D.B.A., 1969, Washington University

585 (BCP) Recent Advances in Receptor Research *(I, 1)* Discussion of current research literature about receptors for hormones, pheromones, neurotransmitters, and other biological signals. Consequences of receptor activation will also be discussed. *(Lec. 1) Pre: 311 and permission of instructor. May be repeated.* Rhoads

599 (BCP) Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

622 (BCP) Advanced Electron Microscopy
See Microbiology 622.

624 (BCP) Advanced Electron Microscopy Laboratory
See Microbiology 624.

642 (BCP) Biochemical Toxicology
See Pharmacology and Toxicology 642.

651, 652 (BCP) Research in Biochemistry *(I and II, 3 each)* Students are required to outline a research problem, conduct necessary literature survey and experimental work, and present the observations and conclusions in a substantial written report. *(Independent Study) Pre: graduate standing.* Staff

695, 696 (BCP) Seminar in Biochemistry *(I and II, 1 each)* Presentation of selected topics from current literature or progress in thesis research, as assigned by the instructor. *(Seminar) S/U credit.* Rhoads

699 (BCP) Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Botany

M.S., Ph.D. (Biological Sciences)
401-792-2161

Graduate Faculty

Director of Graduate Studies: Assistant Professor Joanna F. Norris, Ph.D., 1982, Michigan State University
Professor Roger D. Goos, Ph.D., 1958, University of Iowa
Professor Paul E. Hargraves, Ph.D., 1968, College of William and Mary
Professor Marilyn Harlin, Ph.D., 1971, University of Washington
Professor Keith T. Killingbeck, Ph.D., 1976, University of North Dakota
Professor Richard E. Koske, Ph.D., 1971, University of British Columbia
Professor Theodore J. Smayda, Dr. Philos., 1967, University of Oslo
Professor Elijah Swift V, Ph.D., 1967, Johns Hopkins University
Associate Professor John P. Mottinger, Ph.D., 1968, Indiana University
Assistant Professor Alison W. Roberts, Ph.D., 1990, Texas Tech University
Adjunct Professor Paul S. Chomet, Ph.D., 1988, State University of New York, Stony Brook
Adjunct Professor Albert P. Kausch, Ph.D., 1983, Iowa State University
Adjunct Associate Professor Susan L. Hammen-Winn, Ph.D., 1989, University of Rhode Island
Adjunct Associate Professor Glen D. Thursby, Ph.D., 1983, University of Rhode Island
Adjunct Assistant Professor Eric M. Roberts, Ph.D., 1991, University of Texas, Austin

Specializations

Aquatic botany (marine and freshwater), cell biology, genetics and cytogenetics, mycology, phycology, plant development, plant ecology, plant molecular biology, plant physiology.

Master of Science

Admission requirements: GRE and undergraduate major in the sciences. Candidates lacking undergraduate courses in organic chemistry, physics, mathematics through introductory calculus, and fundamental courses in biological sciences may be required to make up deficiencies without graduate credit.

The completed application package must be received by April 15.

Program requirements: thesis and BOT 581 or 582.

Doctor of Philosophy (Biological Sciences)

Admission requirements: same as for master's degree, which is normally required. Qualifying examination required for those accepted without the master's degree.

The completed application package must be received by April 15.

Program requirements: dissertation; BOT 581, 582. Comprehensive examination will require competency in major areas of botany.

BOT Courses
Botany

418 Marine Botany *(I, 3)*
419 Freshwater Botany *(I, 3)*
432 Mycology: Introduction to the Fungi *(I, 4)*
437 (or BCH 437 or ZOO 437) Fundamentals of Molecular Biology *(I, 3)*
445 Plant Physiology *(II, 3)*
451 (or BCH 451 or MIC 451) Laboratory in Cell Biology *(II, 1)*
453 (or BCH 453 or MIC 453) Cell Biology *(II, 3)*
454 (or BCH 454) Genetics Laboratory *(I, 3)*
455 (or ZOO 455) Marine Ecology *(I, 3)*
457 (or ZOO 457) Marine Ecology Laboratory *(I, 1)*
465 Phycology: An Introduction to the Algae *(II, 3)*

511 Special Readings in Developmental Plant Anatomy *(I, 3)* Intensive tutorial work, research, and reading on ontogeny of plant structures and morphogenetic mechanisms. *(Independent Study) Pre: graduate standing and permission of instructor. Concurrent audit of 311 required. Offered on demand.* Staff

512 Morphology of Vascular Plants *(I, 3)* Comparative survey of development, form, and anatomy of extinct and extant vascular plants and modern interpretation of evidence concerning their interrelationships. *(Lec. 2, Lab. 2) Pre: 311 or equivalent. In alternate years.* Staff

515 Light Microscopy Research Methods *(I, 4)* Introduction to optical techniques and biological specimen preparation for light microscopy with emphasis on application of these methods in biological research. Topics include: optics, embedding and sectioning, fluorescence and immunocytochemistry, and computer image analysis. *(Lec. 1, Lab. 6) Pre: graduate standing or permission of instructor. Offered fall in even-numbered years.* Roberts

521 Recent Advances in Cell Biology
See Microbiology 521.

522 (or BCH 522) Plant Molecular Biology *(I, 4)* Analysis of gene expression in plants including topics such as choloroplast DNA, mitochondrial DNA, transgenic plants, and symbiotic genes. Laboratory includes cloning, restriction mapping, and hybridization. Emphasis on research literature. *(Lec. 2, Lab. 4) Pre: 352, BCH 311, or permission of instructor. In alternate years.* Norris

524 Methods in Plant Ecology *(II, 3)* Methods in analysis of vegetation and microenvironments. Emphasis on quantitative techniques in analysis of vegetation, soil, and microclimate; techniques in physiological ecology. *(Lec. 2, Lab. 3) Pre: 111 and 262 (or ZOO 262) or equivalent; STA 412 recommended. In alternate years. Next offered 1995–96.* Killingbeck

534 Physiology of the Fungi *(II, 3)* Life processes of fungi with particular emphasis on chemical composition, organic and mineral nutrition, toxic and stimulating agencies, and metabolism. Also stresses phenomena of variation of growth and sporulation as affected by various environmental factors. *(Lec. 2, Lab. 2) Pre: 432 or permission of instructor. In alternate years.* Koske

546 Seminar in Plant Stress Physiology *(II, 1–2)* Readings, discussion, and analysis of current literature with emphasis on biochemical and genetic aspects of responses. Students electing two credits will write review papers. *(Seminar) Pre: one course in plant physiology and one course in biochemistry. In alternate years.* Staff

551 Seminar in Aquatic Botany *(I, 1)* Readings and discussion on current research involving algae and other aquatic plants. *(Seminar) Pre: permission of instructor. May be repeated.* Harlin

Associate Professor Terence M. Bradley, Ph.D., 1983, University of Idaho
Associate Professor Joel M. Chandlee, Ph.D., 1984, North Carolina State University
Associate Professor Marian R. Goldsmith, Ph.D., 1970, University of Pennsylvania
Associate Professor William R. Krul, Ph.D., 1967, Purdue University
Associate Professor John P. Mottinger, Ph.D., 1968, Indiana University
Associate Professor David R. Nelson, Ph.D., 1979, University of California, Los Angeles
Associate Professor Dennis E. Rhoads, Ph.D., 1982, University of Cincinnati
Associate Professor Jay F. Sperry, Ph.D., 1974, University of Kansas
Assistant Professor Anthony S. Fischl, Ph.D., 1986, Rutgers—The State University
Assistant Professor Joanna H. Norris, Ph.D., 1982, Michigan State University

Specializations

Neurochemistry of alcoholism, olfactory signal transduction, structure and function of receptors, protein phosphorylation, spectroscopic studies of the structures of nucleic acids and proteins, metabolism of nitrogenous constituents in mammalian tissues, regulation of metabolism, biochemical, molecular, and genetic analysis of plant mutants, biochemistry of salmonid parr-smolt transformation, synthesis of hepatic proteins.

Master of Science

Admission requirements: GRE and a bachelor's degree in some field of science or engineering including two semesters each in organic chemistry with laboratory, biological sciences, and calculus, and one semester in physics. Students may be accepted with deficiencies, which must be made up without program credit.

Program requirements for all M.S. candidates: BCH 435, 521, 541, 581, 582, one credit of 695 or 696, and three credits in an additional 500-level course exclusive of special topics or research. All full-time students are expected to be continuously registered for BCH 695, 696 (Seminar), but no more than one credit can be used for program credit. Thesis option: a minimum of 24 credits (exclusive of thesis credits) including the above requirements and a thesis. Nonthesis option: a minimum of 36 credits including the above requirements, BCH 651 or 652, and the written master's examination.

Doctor of Philosophy (Biological Sciences)

Admission requirements: same as for master's degree candidates; M.S. degree not required to enroll in Ph.D. program. Qualifying examination required of all Ph.D. candidates.

Program requirements: BCH 435, 521, 541, 581, 582, a total of three credits in BCH 695, 696, at least six credits of additional BCH course work at the 500 level exclusive of special topics or research, comprehensive examination, and dissertation. All full-time students are expected to be continuously registered for BCH 695, 696 (Seminar), but no more than three credits can be used for program credit.

BCH Courses
Biochemistry

401 (BCP) (or MIC 401) Quantitative Cell Culture *(I, 3)*
403 (BCP) (or MIC 403) Introduction to Electron Microscopy *(I, 2)*
405 (BCP) (or MIC 405) Electron Microscopy Laboratory *(I, 2)*
412 (BCP) Biochemistry Laboratory *(II, 3)*
421 (BCP) (or MIC 421) Cell Biology and Cancer *(I, 3)*
435 (BCP) Physical Chemistry for Life Sciences *(I, 3)*
437 (or BOT 437 or ZOO 437) Fundamentals of Molecular Biology *(I, 3)*
451 (or BOT 451 or MIC 451) Laboratory in Cell Biology *(II, 1)*
453 (or BOT 453 or MIC 453) Cell Biology *(II, 3)*
454 (or BOT 454) Genetics Laboratory *(I, 3)*
464 Biochemistry of Metabolic Disease *(II, 3)*
481 Principles of Biochemistry I *(I, 4)*
482 Principles of Biochemistry II *(II, 4)*
484 Physical Methods in Biochemistry *(II, 3)*
491, 492 (BCP) Research in Biochemistry *(I and II, 1–6 each)*

502 Techniques in Microbial and Molecular Genetics
See Microbiology 502.

503 (BCP) Electron Microscopy
See Microbiology 503.

505 (BCP) Laboratory in Electron Microscopy
See Microbiology 505.

521 (BCP) Physical Biochemistry *(I, 3)* The use of diffusion, sedimentation, viscosity, electrophoresis, isoelectric focusing, chromatography, and spectroscopy, (including linear and circular dichroism) to determine the size, shape, structure, interactions, and molecular weight of biological macromolecules. *(Lec. 3) Pre: 435 or equivalent. In alternate years. Next offered fall 1995.* Hartman

522 Plant Molecular Biology
See Botany 522.

523, 524 (BCP) Special Topics in Biochemistry *(I and II, 1–3 each)* Advanced work arranged to suit the individual needs of the student. Lecture and/or laboratory according to the nature of the problem. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits. S/U credit for 524.* Staff

541 (BCP) Laboratory Techniques in Biochemistry *(I, 3)* Potentiometric titration and buffers, spectroscopy (UV, visible, and IR), protein assays, radioisotopes, gel electrophoresis, chromatography (thin-layer, ion-exchange, and high-performance), and ultracentrifugation. *(Lab. 9) Pre: general chemistry, organic chemistry, and credit or concurrent enrollment in at least one semester of biochemistry.* Hartman

542 (BCP) Proteins: Purification and Characterization *(II, 3)* Use of techniques for protein purification and activity studies. Laboratories involve enzymology, chromatography, investigation of soluble and membrane-bound receptors, gel electrophoresis and silver staining, thin-layer electrophoresis and autoradiography. *(Lab. 9) Pre: 311 or 581 and permission of instructor.* Rhoads

551 (BCP) (or MTC 551) Topics in Biochemistry for the Clinical Scientist *(I, II, or SS, 3)* Description of the major components of biochemistry as it relates to the medical sciences. Major concepts include molecular genetics, regulatory biochemistry, and medically related applied biochemistry. *(Lec. 3) Offered every third year.* Staff

552 Microbial Genetics
See Microbiology 552.

572 (BCP) Plant Biochemistry
See Plant Sciences 572.

573 Developmental Genetics
See Zoology 573.

579 Advanced Genetics Seminar
See Zoology 579.

581 (BCP) General Biochemistry I *(I, 3)* First semester of a two-semester course on the principles of biochemistry. Topics include: bioenergetics, protein structure, enzymology, glycolysis, the tricarboxylic acid cycle, and oxidative phosphorylation. *(Lec. 3) Pre: CHM 228 and 229.* Rhoads and Tremblay

582 (BCP) General Biochemistry II *(II, 3)* Second semester of a two-semester course on the principles of biochemistry. Topics include: photosynthesis, membranes, hormones, metabolism, the biosynthesis of DNA, RNA, and proteins. *(Lec. 3) Pre: CHM 228 and 229.* Rhoads, Tremblay, and Chandlee

583 (BCP) Metabolism *(I, 3)* Intensive study of metabolic pathways of carbohydrates, lipids, and nitrogenous compounds; their interrelationships. Effects of hormonal and nutritional status on activity of these pathways. *(Lec. 3) Pre: 581, 582, and/or permission of chairperson. In alternate years.* Tremblay

584 (BCP) Membrane Biochemistry *(II, 3)* Review of model systems for biochemical, physical, and chemical studies of cell membranes. Discussion of current research directed at a molecular understanding of membrane structure and function. *(Lec. 3) Pre: credit or concurrent enrollment in 582 or permission of instructor. In alternate years. Next offered 1994–95.* Rhoads

by the College of Business Administration. *(Practicum) Pre: proposal acceptance by the College of Business Administration, no previous internship credit, graduate standing. S/U credit.* Staff

697 Doctoral Research Seminar *(I and II, 3)* Provides a rigorous analysis of current research questions and research techniques used to address those questions in the academic discipline. Recent developments and current issues addressed. *(Sem. 3) Pre: enrollment in Phase II of the Ph.D. program in business administration.* Staff

Animal and Veterinary Science

See Fisheries, Animal and Veterinary Science on page 56.

Applied Mathematical Sciences

Ph.D. (Interdepartmental)
401-792-5592

This interdepartmental program is sponsored by the Departments of Computer Science and Statistics, Industrial and Manufacturing Engineering, Management Science and Information Systems, and Mathematics. It is administered by a coordinating committee selected from the graduate faculty.

Coordinating Committee: Gerasimos Ladas (chairperson), Gérard M. Baudet, David L. Freeman, Leonard M. Kahn, W. Dennis Lawing, Seetharama Narasimhan

Graduate Faculty

Professor Edward J. Carney, Ph.D., 1967, Iowa State University
Professor Rodney D. Driver, Ph.D., 1960, University of Minnesota
Professor Norman J. Finizio, Ph.D., 1972, Courant Institute of Mathematical Sciences, New York University
Professor Edward A. Grove, Ph.D., 1969, Brown University
Professor R. Choudary Hanumara, Ph.D., 1968, Florida State University
Professor James F. Heltshe, Ph.D., 1973, Kansas State University
Professor Jeffrey E. Jarrett, Ph.D., 1967, New York University
Professor Russell C. Koza, Ph.D., 1968, Rensselaer Polytechnic Institute
Professor Gerasimos Ladas, Ph.D., 1968, New York University
Professor Edmund A. Lamagna, Ph.D., 1975, Brown University
Professor James T. Lewis, Ph.D., 1969, Brown University
Professor Pan-Tai Liu, Ph.D., 1968, State University of New York, Stony Brook
Professor Dennis W. McLeavey, D.B.A., 1972, Indiana University; C.P.I.M. (Fellow); C.F.A., 1990
Professor Richard Mojena, Ph.D., 1971, University of Cincinnati
Professor Seetharama Narasimhan, Ph.D., 1973, Ohio State University
Professor Lewis J. Pakula, Ph.D., 1972, Massachusetts Institute of Technology
Professor S. Ghon Rhee, Ph.D., 1978, Ohio State University
Professor Oved Shisha, Ph.D., 1958, Hebrew University
Professor Robert C. Sine, Ph.D., 1962, University of Illinois
Professor E. Ramnath Suryanarayan, Ph.D., 1961, University of Michigan
Professor Donald W. Tufts, Sc.D., 1960, Massachusetts Institute of Technology
Professor Ghasi Ram Verma, Ph.D., 1957, Rajasthan University
Associate Professor Gerard M. Baudet, Ph.D., 1978, Carnegie Mellon University
Associate Professor Frank M. Carrano, Ph.D., 1969, Syracuse University
Associate Professor James G. Kowalski, Ph.D., 1975, University of Notre Dame
Associate Professor William D. Lawing, Jr., Ph.D., 1965, Iowa State University
Associate Professor Bala Ravikumar, Ph.D., 1987, University of Minnesota
Associate Professor David M. Shao, Ph.D., 1970, State University of New York, Buffalo
Assistant Professor Nancy Eaton, Ph.D., 1992, Emory University.
Assistant Professor Colleen Kelly, Ph.D., 1991, University of California, San Diego.
Assistant Professor Joan Peckham, Ph.D., 1990, University of Connecticut
Assistant Professor Catherine Roberts, Ph.D., 1992, Northwestern University
Assistant Professor Victor Wolfe, Ph.D., 1991, University of Pennsylvania
Professor Emeritus Emilio O. Roxin, Ph.D., 1959, University of Buenos Aires

Specializations

Applied mathematics, computer science, operations research, statistics, and applied probability.

Doctor of Philosophy

Admission requirements: GRE with advanced test in undergraduate field, bachelor's degree in computer science, engineering, mathematics, management science, physical sciences, statistics, or equivalent. With permission, GMAT may be substituted for GRE by applicants with business background. Applicants with entrance deficiencies may be accepted subject to taking certain undergraduate courses in addition to the graduate program requirements. Although a person with a bachelor's degree may be admitted, this program is designed principally for people who have a master's degree.

Program requirements: dissertation, 54 credits beyond the bachelor's degree including MTH 435, 436, two courses selected from MTH 462, 513, 515, 535, 545, 561, and 641, and three core courses in each of two of the following areas: applied mathematics, basic analysis, numerical analysis, computer science, operations research, statistics, and applied probability. (A maximum of 30 credits may be granted for a master's degree in a closely related area.) Comprehensive examination in core areas and reading proficiency in one foreign language. The oral comprehensive examination should include a faculty member from the Mathematics Department. The Ph.D. qualifying examination is required of students admitted without the master's degree. All Ph.D. candidates must register full time for two consecutive semesters prior to the Ph.D. comprehensive examination.

Also see the listing under Mathematics, page 71.

AMS Courses
Applied Mathematical Sciences

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Aquaculture

See Fisheries, Animal and Veterinary Science on page 56.

Audiology

M.A., M.S.

See Speech-Language Pathology on page 104.

Biochemistry and Biophysics

M.S., Ph.D. (Biological Sciences)
401-792-2201

Graduate Faculty

Chairperson and Director of Graduate Studies: Professor David C. Laux, Ph.D., 1971, University of Arizona
Professor Victor J. Cabelli, Ph.D., 1951, University of California, Los Angeles
Professor Paul S. Cohen, Ph.D., 1964, Boston University
Professor Karl A. Hartman, Jr., Ph.D., 1962, Massachusetts Institute of Technology
Professor Linda A. Hufnagel, Ph.D., 1967, University of Pennsylvania
Professor Richard W. Traxler, Ph.D., 1958, University of Texas
Professor George C. Tremblay, Ph.D., 1965, St. Louis University
Professor Norris P. Wood, Ph.D., 1955, University of Pennsylvania

Associate Professor Edmund J. Boyle, Ph.D., 1990, Pennsylvania State University; C.P.A.
Associate Professor Marshall A. Geiger, Ph.D., 1988, Pennsylvania State University; C.P.A.
Associate Professor Charles Hickox, J.D., 1979, Washington University
Assistant Professor Judy K. Beckman, Ph.D., 1991, Texas Tech University; C.P.A.
Assistant Professor Alejandro Hazera, D.B.A., 1989, University of Kentucky; C.P.A.
Assistant Professor Jeffrey W. Power, Ph.D., 1991, Purdue University; C.M.A.

Master of Science

The Master of Science in accounting program is appropriate for students with a variety of educational backgrounds and professional interests. The program has the objective of providing an accounting and business foundation for the student with an undergraduate degree in an area other than accounting. These students graduate with a strong theoretical understanding of accounting along with the necessary technical background. They are equipped to perform exceedingly well in entry-level positions in accounting. The objective for students with undergraduate degrees in accounting is to provide a fifth year of conceptual, theoretical, and technical education in accounting, finance, management science, and other areas where the student and program director feel the student can gain the most toward achieving his or her educational objectives.

Applicants with a bachelor's degree in accounting from an accredited institution can complete the program of study in one year. Applicants with no prior education in business will need to spend two years in full-time study or longer if studying part time. The course of study is divided into two parts. Part one is a common body of knowledge in business and accounting that is required for all students without a bachelor's degree in business. The student's undergraduate record is evaluated, and common body of knowledge courses are waived when a student has undergraduate equivalents. The second phase of the program allows the students to build on their accounting foundation and develop a high level of theoretical knowledge and a sound understanding of accounting principles and techniques. During the second part of the program the student selects an area in which to specialize. Two areas are available: 1) financial reporting and auditing and 2) taxation.

Admission requirements: undergraduate quality point average of approximately B or above and a score at the 50th percentile or above on the GMAT Examination are expected. The GMAT score and the undergraduate quality point average are not the sole criteria for admission. However, those with undergraduate quality point averages of less than B or with lower than 50th percentile scores on the GMAT have a reduced probability of admission. Applicants for whom English is not the native language will be expected to demonstrate proficiency in written and oral communications (TOEFL score of 575 or above), or they may be required to correct deficiencies by taking selected courses for no program credit.

Program requirements: from 30 to 69 credits, depending on undergraduate program. A written comprehensive examination and a course requiring a major paper involving independent study are required in the nonthesis option.

All 600-level courses offered by the departments in the College of Business Administration are open to matriculated graduate students only.

ACC Courses

Accounting

413 Contemporary Accounting Issues *(II, 3)*
415 Accounting Computer Systems *(I and II, 3)*
431 Advanced Accounting *(I, 3)*
443 Federal Tax Accounting *(II, 3)*
461 Auditing *(I, 3)*

535 Advanced Problems in Accounting *(II, 3)* General and specialized accounting problems that constitute the subject matter of C.P.A. examinations. *(Lec. 3) Pre: 431.* Staff

544 Taxation of Corporations and Shareholders *(II, 3)* Examination of the tax laws affecting corporations and shareholders. Includes law governing corporate formation, liquidating and nonliquidating distributions, reorganizations, taxes on corporation accumulations, and planning of transactions for tax compliance and minimization. *(Lec. 3) Pre: 443 or permission of instructor.* Matoney

562 Advanced Auditing *(II, 3)* Statements on auditing standards, auditing electronic systems, auditor's reports, statistical sampling in auditing, regulations of SEC, and cases in auditing. *(Lec. 3) Pre: 461.* Boyle

610 Financial Accounting *(I and II, 4)* Covers basic accounting principles, accounting systems design, and financial statement analysis. Includes principles of responsibility accounting and budgeting. *(Lec. 4) Pre: mathematics or statistics, ECN 590, MGS 520 and 530.* Staff

611 Managerial Accounting *(I or II, 3)* Determination of accounting information for the purposes of decision making, control, and evaluation with emphasis on decision models using accounting information. *(Lec. 3) Pre: 610, MGS 520 and 530.* Staff

618 Current Accounting Theory *(I, 3)* Critical examination of accounting theory and practice to develop research techniques with emphasis on financial accounting. *(Lec. 3) Pre: 311 and 312.* Staff

619 Current Accounting Theory *(II, 3)* Critical examination of accounting theory and practice with respect to cost and managerial accounting. *(Lec. 3) Pre: 321.* Staff

631 International Accounting *(II, 3)* Covers interpretation of international financial statements, focusing on foreign currency exchange, comparative accounting principles and disclosures, and audit reports. Uses actual financial statements in case analyses. *(Lec. 3) Pre: 610 or permission of instructor.* Staff

641 Federal Taxation Seminar *(II, 3)* Examination and discussion of the laws and rationale affecting the federal taxation of individuals as well as an introduction to research in taxation. *(Lec. 3) Pre: 311 and graduate standing in accounting.* Staff

643 Federal Taxes and Business Decisions *(II, 3)* The course focuses on tax law and its effect on business decisions. Cases are employed and primary emphasis is on income tax planning, although estate and gift taxes are explored. *(Lec. 3) Pre: 610.* Staff

644 Partnership, Estate, and Gift Taxation *(II, 3)* Examination of the tax laws affecting partnerships, estates, and gifts. Includes income and wealth taxation with an emphasis on tax avoidance through effective planning. *(Lec. 3) Pre: 641.* Matoney

645 Advanced Topics in Federal Taxation *(II, 3)* Examination of tax laws governing sales and exchanges, accounting methods, accounting changes, deferred compensation, tax shelters, and recent developments in the tax laws. *(Lec. 3) Pre: 443 or 641.* Matoney

646 Seminar in Tax Research, Policy, and Planning *(I, 3)* Examination of the methodology of tax research, the principles and procedures involved in tax planning, and the procedures involved in dealing with the IRS. *(Sem. 3) Pre: 641 or equivalent.* Matoney

661 Seminar in Auditing *(I, 3)* Readings and discussions on auditing standards, procedures, programs, working papers, internal control, and current auditing topics. *(Sem. 3) Pre: 311 and graduate standing in accounting.* Staff

681 Accounting Policy *(II, 3)* Development of accounting policy with respect to managerial planning and control. Emphasis on analytical evaluation of cases with major research project. *(Lec. 3) Pre: 618, graduate standing, and completion of all foundation courses.* Staff

691, 692 Directed Study in Accounting *(I and II, 1–3 each)* Advanced work under the supervision of a staff member and arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

693 Internship in Accounting *(I and II, 3)* Participation in management and/or problem solving under the supervision and guidance of a sponsoring agency with evaluation

The roman numeral indicates the semester the course will normally be offered; some courses, however, are offered only in alternate years and a few less frequently. The *Schedule of Courses* issued by the Office of the Registrar during the October and March registration periods must therefore be consulted to determine which courses will be offered in the following semester. The arabic numeral indicates the credits; distribution of class hours each week is in parentheses. The instructor's name follows the course description.

The availability of programs of study and areas of specialization listed in this section, and their administrative location, requirements, and titles, are subject to change without notice.

Students who are interested in the career opportunities related to particular programs of study are encouraged to discuss their interests with the appropriate department chairperson or with the director of graduate studies as listed in this bulletin, with the Dean of the Graduate School, or with the staff of the Office of Career Services. Students who are uncertain about their career choice are invited to use the services offered by the Counseling Center.

Successful completion of any course of study at the University, however, does not guarantee that the student will find either a specific kind or level of employment.

Accounting

M.S.
401-792-2073

Graduate Faculty

Chairperson: Professor Henry R. Schwarzbach, D.B.A., 1976, University of Colorado; C.P.A.

Director of Graduate Studies: Associate Professor Mark Higgins, Ph.D., 1989, University of Tennessee; C.P.A.

Professor Spencer J. Martin, Ph.D., 1970, University of Illinois; C.P.A.

Professor Joseph P. Matoney, Jr., Ph.D., 1973, Pennsylvania State University; C.P.A.

Professor Richard Vangermeersch, Ph.D., 1970, University of Florida; C.P.A., C.M.A.

Course Codes

ACC Accounting
ADE Adult and Extension Education
AAF African and Afro-American Studies
AVS Animal and Veterinary Science
APG Anthropology
AMS Applied Mathematical Sciences
ASP Aquacultural Science and Pathology
ART Art
ARH Art History
AST Astronomy
BCH Biochemistry
BOT Botany
BUS Business Administration
BSL Business Law
CHE Chemical Engineering
CHM Chemistry
CVE Civil and Environmental Engineering
COM Communication Studies
CMD Communicative Disorders
CPL Community Planning
CLS Comparative Literature Studies
CSC Computer Science
CNS Consumer Studies
DHY Dental Hygiene
ECN Economics
EDC Education
ELE Electrical Engineering
ENG English
ENT Entomology
FIN Finance
FST Fisheries Science and Technology
FSN Food Science and Nutrition
FRN French
GEL Geology
GER German
GRK Greek
HIS History
HED Home Economics Education
HDF Human Development and Family Studies
HSS Human Science and Services
IME Industrial and Manufacturing Engineering
INS Insurance
ITL Italian
JOR Journalism
LRS Labor and Industrial Relations
LAR Landscape Architecture
LAT Latin
LSC Library and Information Studies
LIN Linguistics
MGT Management
MIS Management Information Systems
MGS Management Science
MAF Marine Affairs
MRD Marine Resource Development
MKT Marketing
MTH Mathematics
MCE Mechanical Engineering and Applied Mechanics
MTC Medical Technology
MCH Medicinal Chemistry
MIC Microbiology
MUS Music
NRS Natural Resources Science
NES New England Studies
NUR Nursing
OCE Ocean Engineering
OCG Oceanography
OMT Operations Management
PCG Pharmacognosy
PCL Pharmacology and Toxicology
PHC Pharmaceutics
PHP Pharmacy Practice
PHL Philosophy
PED Physical Education
PHT Physical Therapy
PHY Physics
PLS Plant Sciences
PSC Political Science
PSY Psychology
QBA Quantitative Business Analysis
RDE Resource Development Education
REN Resource Economics
RUS Russian
SOC Sociology
SPA Spanish
STA Statistics
TMD Textiles, Fashion Merchandising, and Design
THE Theatre
URB Urban Affairs
WMS Women's Studies
WRT Writing
ZOO Zoology

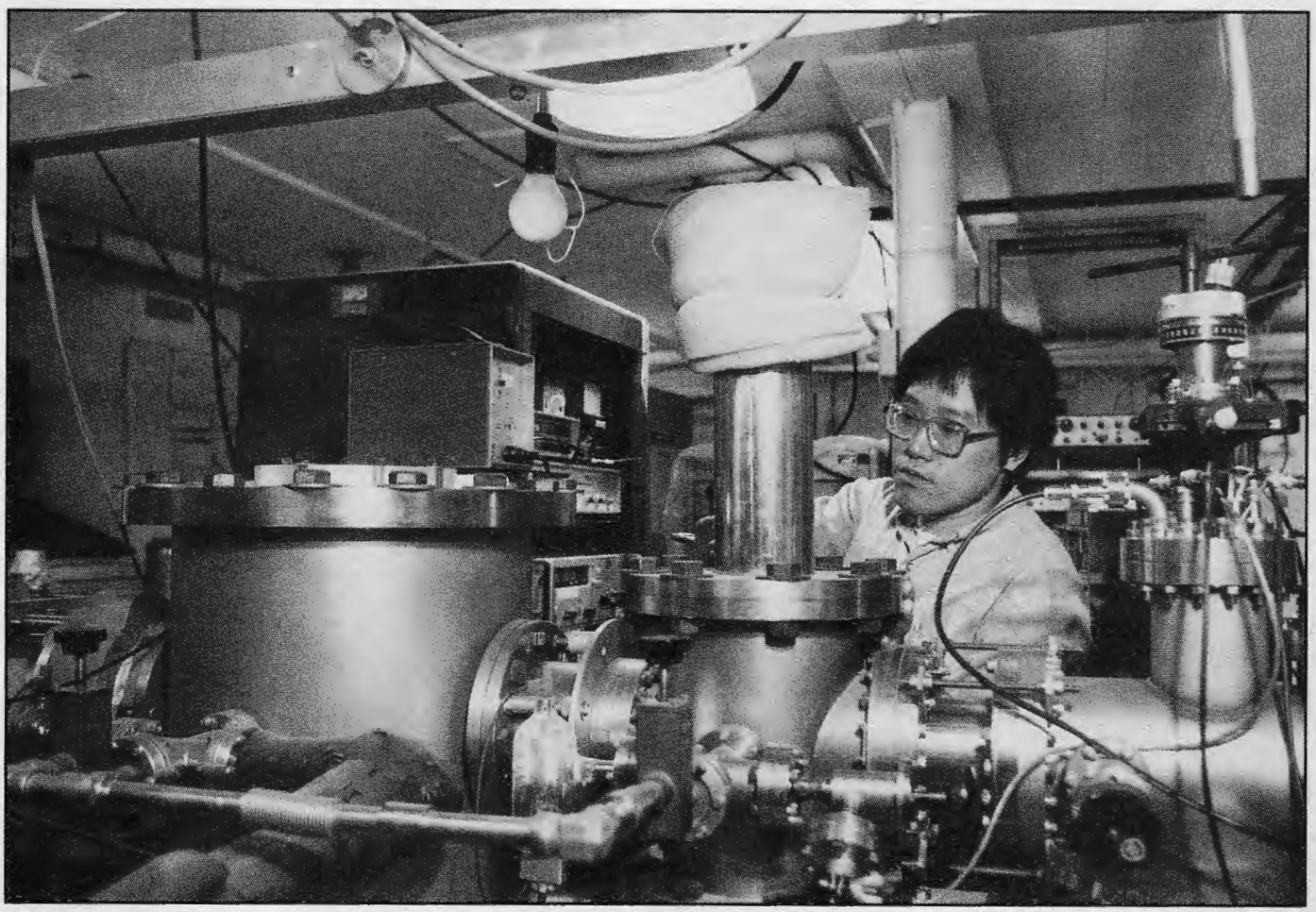
GRADUATE PROGRAMS

This section must be read in conjunction with the preceding "Degree Requirements" and "Admission and Registration" sections. The specific admission and program requirements listed in this section are included within the general requirements set forth in the preceding sections, and do not reduce those general requirements. For example, in nonthesis master's degree programs, all students must take at least one course that requires a substantial paper involving significant independent study. All Ph.D. candidates who do not hold an earned master's degree in a closely related field are required to take the Ph.D. qualifying examination even if it is not listed in the individual program requirements.

The admission requirement of standardized test scores (GRE, GMAT, MAT) is specific to the particular program. For programs that require a standardized test, applications will not be reviewed until the scores have been received. In all other cases, scores may be submitted if applicants believe the test results will enhance their application. However, the test results should be submitted as early as possible. If an application package is received before the test results, the admission decision may be made without the scores.

Please note that the specific program requirements given on the following pages are minimum requirements. For example, additional course credits may be required for individual candidates whose academic background is considered to be insufficient. All graduate-level courses are also described in this chapter. Undergraduate courses numbered at the 400 level, permitted for graduate credit in some cases, are described in the *Undergraduate Bulletin* and are listed here for reference only. Courses at the 500 level must comprise the majority of course work between the bachelor's and the master's degrees. Those at the 600 level are advanced graduate courses. The 900-level courses are special types of graduate courses for which no degree credit is given. They include courses offered to remedy deficiencies as well as workshops, institutes, and courses offered one time only by visiting faculty.

Courses with two numbers, e.g., ASP 501, 502, indicate a year's sequence, and the first course is either a prerequisite for the second or at least the two cannot be taken in reverse order without special permission. Parentheses after a course number enclose either the old course number or, in cases of multiple listings, the departments and numbers under which the course is also offered.



Graduate School of Oceanography Alumni Endowment. Income from endowment awarded annually to a student from the Graduate School of Oceanography on the basis of scientific proposals.

Gray Family Endowment. Income from endowment for a scholarship to a graduate student in the Department of Chemical Engineering doing research in the field of efficient supply and use of energy. Recipient selected by the College of Engineering.

Arthur D. Jeffrey Memorial Scholarship. Income from endowment awarded to a graduate student in community planning on the basis of financial need.

Joshua MacMillan Graduate Fellowship. Income from the Davis Family Endowment awarded annually on the basis of financial need to a master's or doctoral student with a marked interest in research related to fisheries science.

Thomas and Kathy McNiff Graduate Student Endowment. Income from endowment awarded annually to a student in the marine sciences. Recipient selected by the Student Financial Aid Office.

L. Douglas Nolan '52 Academic Achievement in Science Award. Income from endowment awarded annually to a graduate student who excels in one of the natural sciences.

William Potter Prizes in Chemistry. Awarded to Ph.D. students in pharmacy on the basis of academic achievement in chemistry.

Dr. and Mrs. James P. Reid Endowed Scholarship. Income from endowment for a scholarship in physical education awarded annually to a master's or doctoral student on the basis of academic scholarship, professional interest, and involvement. Preference to second-year students.

Lance A. Ricci Fellowship. Income from endowment awarded annually to a financially deserving GSO graduate student. Recipients selected by the Graduate School and the Graduate School of Oceanography.

Ada L. Sawyer Endowment for Oceanography. Income from endowment awarded annually to an M.A. or Ph.D. student on the basis of financial need and/or merit. Recipient must be born in the United States and be in good standing with the University. Preference given to a woman demonstrating the spirit and ingenuity of Ada L. Sawyer.

URI Alumni Association Graduate Scholarship. This scholarship provides a stipend and tuition remission and is awarded annually by the Graduate Dean to an outstanding graduate student.

URI Class of 1930 Fellowship. Income from endowment for a graduate fellowship.

URI Class of 1933 Fellowship. Income from endowment for a graduate fellowship.

URI Foundation Endowment. Income from endowment for a graduate student fellowship. Recipient selected by the Dean of the Graduate School from University-wide recommendations.

Milton Waltcher '41 Memorial Endowment. Income from endowment for annual awards to go to a deserving chemistry graduate student during summer months.

Germaine and Francis Webb Graduate Fellowship in Oceanography. Income from endowment awarded annually to a student from the Graduate School of Oceanography based on genuine financial need and research related to relevant marine environmental issues. The recipient is selected by the Dean of the Graduate School of Oceanography.

Policy on Satisfactory Academic Progress

The Education Amendments of 1980, P.L. 96-374, October 3, 1980, state that "a student is eligible to receive funds from federal student financial aid programs at an institution of higher education if the student is maintaining satisfactory progress in the course of study he or she is pursuing according to the standards and practices of that institution."

To maintain satisfactory progress as a graduate student at the University of Rhode Island for federal financial aid purposes, the student must be enrolled in a degree-granting program on at least a half-time basis (i.e., five credits) for each semester during which aid is received. The courses must be at the graduate level and applicable to the student's approved program of study. Master's degree candidates have eight semesters to complete degree requirements on a full- or part-time basis. Students who are not in residence during the academic-year terms and who have received special permission from the Dean of the Graduate School have 14 summer sessions in which to complete requirements. Two summer sessions totaling at least five credits will be considered one part-time semester; two summer sessions totaling nine credits will be considered one full-time semester. Doctoral degree candidates have 14 semesters in which to complete their degrees, regardless of whether they matriculate with an earned master's degree.

Master's and doctoral students who have completed all course requirements including thesis research shall be considered to be making satisfactory progress at least at the half-time rate if they are registered for at least one thesis credit, or continuous registration for those in the nonthesis option. All students must be enrolled for consecutive semesters until graduation unless an official leave of absence has been approved. If students do not exercise the leave of absence option and fail to register, they are considered to have voluntarily withdrawn.

For further information, see the *Graduate Student Manual* or consult the Student Financial Aid Office. Phone: 401-792-2314.

from various sources to help students with financial need. Need is defined as the difference between what it costs to attend URI and what the student and family can contribute from their financial resources, including all other sources of assistance. The student is expected to earn a portion of these resources. Only citizens, nationals, or permanent residents who have been accepted and are matriculated as URI graduate students are eligible. Special students and students attending only during the summer sessions are ineligible. The national Free Application for Federal Student Aid should be submitted to Federal Student Aid Programs in Iowa after January 1, and no later than March 2. For further information or copies of the forms, contact the Student Financial Aid Office in Roosevelt Hall. Phone: 401-792-2314.

Federal Aid. *Federal Perkins Loan.* Graduate students can borrow up to $30,000, including any undergraduate loans. These loans have a simple interest rate of five percent annually. Interest does not accrue until nine months after graduation or withdrawal. Minimum payments of $90 per quarter are required, and the repayment period may extend up to 10 years.

Federal Work-Study Program. This federally supported program provides part-time employment during the school term and full-time employment during vacation periods. The jobs may be either with University departments or with off-campus, nonprofit, nonsectarian, and nonpolitical agencies. Other institutionally funded employment is also available. A listing of these jobs is maintained by the Student Financial Aid Office.

Federal Stafford Loan Program. All students who complete the Free Application for Federal Student Aid can participate in the Stafford Loan Program. Those students who meet the financial need criteria may receive in whole or in part a subsidized loan where the federal government pays all interest until six months after graduation, withdrawal, or a drop in enrollment status to less than half time. Unsubsidized loans are available for those students who do not qualify for the need-based subsidized Stafford loan. The same terms and conditions as for subsidized Stafford loans apply, except that the borrower is responsible for the interest that accrues while the student is in school. Graduate and professional students may borrow up to $10,000. The aggregate loan limit for full-time graduate and professional students is $73,000.

Federal Supplemental Loans for Students (SLS). The SLS program has been merged into the unsubsidized component of the Stafford Loan Program and will no longer exist as a separate program.

University Aid. *Regular Student Employment.* Positions funded by the University are available to several hundred students, and are listed in the Student Financial Aid Office.

University Loans. Emergency loans ranging from $10 to $200 are available to full-time students. These loans are short-term in nature (14–90 days) and can be made only when there is a means of repayment. Application forms are available in the Student Financial Aid Office.

Veterans Benefits. Information can be obtained from the veterans liaison officer in the Office of the Registrar. All students receiving veterans benefits are required to report to the veterans liaison officer when withdrawing from or dropping any course, or when withdrawing from the University. Failure to do so will result in the termination of veterans benefits.

Special Awards

Ward Abusamra Scholarship in Music and Voice. Income from endowment for a scholarship in music awarded annually to a graduate or undergraduate music major on the basis of merit. Preference given to students concentrating in voice or chorus. Recipient to be selected by the Department of Music Recruitment and Awards Committee during annual spring auditions.

Academy of American Poets Prize Program. Income from the Nancy Potter Scholarship Fund endows two $100 prizes to be awarded each year by the Academy of American Poets.

Stanley Berger Memorial Scholarship. Income from endowment to be awarded annually to a graduate student in clinical psychology. Recipient selected by the Department of Psychology.

Bertran M. Brown '36 Endowment. Income from endowment used for graduate student support in the Department of Chemistry.

James Corless Prize in Marine Chemistry. Income from endowment for an award in water chemistry given annually if there is a worthy student.

Catharine and Walter Eckman Memorial Scholarship. Income from endowment awarded to a graduate student in the humanities, including English, comparative literature, languages, history, philosophy, music, and political science. Recipient selected by the Graduate School Committee on Scholarships and Fellowships.

Farmer Family Trust—The Pacifico A. Colicci Award in Oceanography Engineering. Award made each year at graduation to a student at the Graduate School of Oceanography who demonstrates exceptional vision and creativity in fashioning instruments for use in oceanography research.

Farmer Family Trust—The Henry S. Farmer Award in Biological Oceanography. Award made each year to a student in biological oceanography who demonstrates exceptional creativity and interest in preserving and developing the oceans as a biological resource.

Robert H. '35 and Marjorie P. '36 Fillmore Memorial Scholarship. Income from endowment fund, established by Judith A. Fillmore in memory of her mother and father, awarded to an undergraduate or graduate student on the basis of good scholastic standing who demonstrates financial need and is enrolled in a URI ocean sciences program. First consideration is given to sons and daughters of the URI Washington Alumni Club, Washington, D.C.

John J. Fisher Memorial Endowment Award. Income from endowment for an annual award in geology to a graduate assistant on the basis of service to the Department of Geology and a strong academic record.

Graduate Library School Scholarship. Income from endowment awarded annually to a student enrolled in the Graduate Library and Information Studies program.

semester and/or disenrollment. Appropriate University departments will provide the student with notice of the debt, reason for it, and a review, if requested. A student must fulfill all financial obligations to the University before receiving transcripts or a diploma.

Transcripts. Each student who attends the University is entitled to official transcripts without charge. Students can obtain a copy of their transcripts by submitting a written request to the Office of the Registrar. A transcript service fee of $25 is assessed to all students in their first semester of enrollment at the University.

Transcripts will not be issued to students who have any unpaid financial obligation to the University.

Financial Aid

There are several forms of financial assistance available to graduate students. To be eligible for any form of assistance, the student must first be admitted as a degree candidate. Detailed information (stipends, allowances, tenure, etc.) on fellowships, scholarships, and assistantships is available from the Graduate School Office. Fellowships and scholarships are awarded by the Dean of the Graduate School to students selected from nominations submitted by department chairpersons. Students are advised to request nomination for these awards by the chairperson of the department in which they plan to study or in which they are currently enrolled at the University.

Graduate students on URI fellowships, scholarships, and assistantships are expected to be full-time students in good academic standing and are not eligible for additional employment unless written permission is received from the Dean of the Graduate School.

Fellowships. Fellowships are awarded to graduate students in recognition of their achievement and promise as scholars. They are intended to enable students to pursue graduate studies and research without rendering any service to the University. Graduate fellows are required to be full-time students (12 credits per semester) and may not engage in additional remunerative work without the specific advance approval of the Dean of the Graduate School.

Patricia Roberts Harris Fellowships are available to doctoral-level students in selected fields. Recipients are nominated by departments. *URI Diversity Graduate Fellowships* are awarded by the Dean of the Graduate School to students from minority and underrepresented groups. *URI Foundation Minority Fellowships* are also available to students from minority and underrepresented groups, with nominations usually made by departments to the Dean of the Graduate School.

Special Fellowships are supported by various industrial firms, private foundations, and individuals, and are usually restricted to students in particular areas of study and research. The stipends and supplemental allowances of these fellowships are not uniform.

URI Fellows receive a stipend of at least $8,305 for the academic year and have tuition and the registration fee paid from University funds. URI Fellows are responsible for the remaining fees. Those wishing to be considered for fellowships must have their application file completed no later than February 1.

Graduate Assistantships and Graduate Research Assistantships. Assistantships are awarded to full-time graduate students to provide them with teaching and research training. Assistants may be required to provide service for up to 20 hours per week. Appointments are initiated by department chairpersons. To be eligible for such an appointment, students must first be admitted as degree candidates. Applications for assistantships should be completed by February 1. Appointments are announced in early April.

Departmental Graduate Assistants assist, under supervision, with instructional and/or research activities of a department. Not more than 10 hours per week will be in classroom contact. Graduate assistant stipends for the 1994–95 academic year range from $8,305 to $9,185, depending upon qualifications. In addition, tuition and the registration fee (12 credits maximum) are paid from University funds for each semester of the academic year of the appointment. The student is responsible for the remaining fees. Additional remuneration is given for appointments during the summer, although this cannot be guaranteed. Stipends and tuition remissions for students appointed to partial assistantships will be prorated for the period of the appointment. The student will be responsible for the remainder of the full-time tuition and fees. The same policy applies to assistantships terminated during the academic year.

Graduate Research Assistants are assigned to individual research projects sponsored either by the University or by an outside agency. On supported research contracts and grants, the graduate research assistants are expected to devote 20 hours per week to research activities. For this they normally receive a stipend ranging from $8,305 to $9,185 for nine months. In addition, tuition (12 credits maximum) and the registration fee are paid in each semester of the academic year of the appointment. The student is responsible for the remaining fees. Additional remuneration is given for appointments during the summer months. Stipends and tuition remissions for students appointed to partial assistantships will be prorated for the period of the appointment. The student will be responsible for the remainder of the full-time tuition and fees. The same policy applies to assistantships terminated during the academic year.

Tuition Scholarships, which cover tuition and registration fee, are awarded by the Dean of the Graduate School from University funds. These scholarships are awarded to qualified students demonstrating financial need. Application forms are available in the Graduate School Office.

Other Sources of Aid

There are many additional sources of financial aid available to students who qualify: scholarships from private organizations, clubs, labor unions, fraternities, sororities, and businesses; Vocational Rehabilitation financial support and Veterans Administration benefits, including survivor benefits. Students should apply directly to the source if they believe they qualify. Graduate students have access to a national computerized database of fellowships and other financial assistance opportunities available to students pursuing advanced degrees, completing dissertation research, or seeking postdoctoral positions.

In addition, limited amounts of aid from federal and state sources are available through the Student Financial Aid Office. This office distributes money

Students maintaining continuous enrollment and registered for no credit (CRG 999) are required to pay a fee of $195 per semester.

Reassessment of Fees. Students are allowed to drop and add credits during the first two weeks of each semester (add period). Fees are reassessed and adjusted according to the credit enrollment, and student status resulting from drop and add transactions are processed by the Office of the Registrar during the add period. Following the add period, term bills are only reassessed for students who add credits. The dropping of credits after the add period does not reduce term bills.

Application Fee. An application fee must accompany each application for admission: $30 for in-state and $45 for out-of-state residents. See page 18 for application procedures.

Additional Fees. Students may be asked to make key deposits and to cover incidental expenses for specific courses. A $25 laboratory/clinical fee will be assessed for any course that has a laboratory or clinical component. Students taking applied music courses, except for composition, are charged an additional fee of $95 for one credit (half hour of a private lesson per week) and $190 for two, three, four, or six credits (one hour of a private lesson per week). Applied music courses for which students are charged an additional fee are MUS 110, 210, 310, 410, and 510.

During their second semester of study, each student must pay a $30 graduation fee. Master's degree candidates must pay a thesis-binding fee of $18, and doctoral candidates must pay dissertation-binding and microfilming fees of $78. These fees are due before candidates submit their dissertations for approval by the Graduate School.

Late Fees. A late registration fee of $20 during the first week of classes, and $55 thereafter, is charged unless it is waived by the Office of the Registrar.

Remission of Fees. Tuition and the registration fee are paid from University or grant funds for holders of tuition scholarships, graduate assistantships, and graduate research assistantships (12 credits maximum per semester), and most fellowships. The students are required to pay all other fees including the Health Services and Student Health Insurance fees, the Memorial Union fee, the graduate student assessment, the library/information services fee, the arts and culture fee, and the athletics fee. Tuition for students appointed to partial assistantships will be prorated for the period of the appointment. The student will be responsible for the remainder of the full-time tuition and fees. The same policy applies to assistantships terminated during the academic year.

University Refund Policies. Refunds of payments to the University will be made according to the following two policies.

Withdrawal of Continuing Students. Continuing students are those who are enrolled for the most previous semester or, in the case of a leave of absence, as of the approved date of leave. Refunds of payments are made to continuing students who officially withdraw from the University or take a leave of absence according to the following scale:

Attendance Period	% Charged	% Refunded
Week 1	10	90
Week 2–4	50	50
Week 5–8	75	25
Week 9 to End of Term	100	0

Under this policy, registration, insurance, auxiliary, and similar fees are **not refundable** as of the first day of classes. Amounts owed by the student and not paid by the withdrawal date are deducted from the refund amount due the student. This scale also applies to first-time students who do not receive Title IV Federal Financial Aid.

Withdrawal of First-Time Students Receiving Title IV Federal Financial Aid. First-time students (those who have never attended the University) receiving Title IV federal aid (Pell, SEOG, etc.) who withdraw from the University are subject to a federally regulated withdrawal refund policy. This policy may change as statutory and regulatory changes covering student financial assistance take effect. Under this policy, the amount of tuition, fees, and room-and-board charges to be refunded is calculated according to the following scale:

Attendance Period	% Charged	% Refunded
Week 1	10	90
Week 2–3	20	80
Week 4	30	70
Week 5–6	40	60
Week 7–8	50	50
Week 9	60	40
Week 10 to End of Term	100	0

The refund is based upon a student's attendance period rounded down to the nearest ten percent but never less than ten percent. Amounts owed by the student and not paid by the withdrawal date are deducted from the residual bill amount when calculating the refund. A reasonable administrative fee not to exceed the lesser of five percent of charges assessed or $100 is charged.

Examples of refund calculations are available at the Bursar's Office.

For the purposes of refund under both policies, the attendance period begins on the first day of classes and ends on the official date of withdrawal or leave of absence. If an official date is not known, the last known date of attendance is used. The number of weeks in attendance is calculated using the round-up method; i.e., the first day of the second week of attendance constitutes an entire week.

Students who withdraw or take a leave of absence during the add period (the first two weeks of school) are assessed tuition and fees based upon the highest number of credits for which they are registered during this period. Refunded amounts are calculated according to the scales above.

The Student Health Insurance fee is not refundable unless the fee is waived, regardless of the date of withdrawal, since the student is covered for the entire academic year. The fee is cancelled, however, if the student withdraws prior to the first day of classes.

Indebtedness to the University. Failure to make full payment of all required fees or to resolve other debts to the University (for example, unreturned athletic equipment, overdue short-term or emergency loans, lost library books, debts to the Office of Housing and Residential Life for damages, and obligations required by the University Student Discipline System) may result in denial of registration for the following

Rhode Island or to the New England Board of Higher Education, 45 Temple Street, Boston, MA 02111.

Rhode Island Interinstitutional Exchange. Full-time students matriculated at one of the public institutions of higher education in Rhode Island may enroll for a maximum of seven credits of their full-time schedule per semester for study at one of the other public institutions at no additional expense. Each institution will determine and maintain the integrity of the degree to be awarded. Students will be subject to the course selection process applicable at the receiving institution. Summer session and continuing education registrants are not covered under this program. Students interested in this arrangement should contact the Office of the Registrar.

New England Land-Grant Student Exchange Program. In order to provide graduate students at the New England land-grant universities with expanded access to unique programs and faculty expertise, these institutions have agreed to encourage student exchanges on a short-term basis. Students with special academic interests may take advantage of the talent and resources available at the state universities of the region without becoming a degree candidate at another institution.

To participate in this program, students must: 1) identify at least one course or a combination of courses related to their area of academic interest which is not available on their home campus, or which is available but is taught with a significantly different viewpoint or methodology; 2) obtain approval from their appropriate academic advisor and the graduate program director; 3) receive permission from the university exchange authorities at both the sending and the receiving institutions; and 4) meet the minimum eligibility requirements. Graduate students must have been admitted to a degree program, be in good standing, and have the permission of their dean's office.

Tuition Waiver for Senior Citizens. Any Rhode Island resident senior citizen who submits evidence of being 60 years of age or over, and of having a household income of less than three times the federal poverty level, will be allowed to take courses at any public institution of higher education in the state with the tuition waived. However, students who qualify for waivers must apply for financial aid. Any aid received must be applied toward the amount waived. Admission into particular courses will be granted on a space-available basis and at the discretion of the receiving institution. All other costs of attendance are paid by the student.

Tuition Waiver for Unemployed. Any individual who submits evidence of currently receiving unemployment benefits from the state of Rhode Island, of having a household income of less than three times the federal poverty level, and of not being claimed as a dependent by a parent (or someone else) will be allowed to pursue course work at any public institution of higher education in Rhode Island with tuition and the registration fee waived. However, students who qualify for waivers must apply for financial aid. Any aid received must be applied toward the amount waived. Individual students will be responsible for all other costs of attendance. Admission into particular courses will be granted on a space-available basis and at the discretion of the particular institution. This waiver also applies to any Rhode Island resident who submits evidence of residency and of currently receiving unemployment benefits in another state.

Schedule of Fees. This schedule of fees is effective for the 1994–95 academic year. The University reserves the right to revise its schedule of tuition and fees without notice.

Full-Time, One Academic Year

Students registered for 9–15 credits, graduate research assistants, and graduate assistants are considered full time and are charged the following fees:

Tuition	
Rhode Island residents	$3,154
Regional students	4,732
Out-of-state residents	7,748
Standard Fees	
Registration fee	40
Graduate student assessment	20
Memorial Union fee	146
Recreation fee	70
Health Services fee	408
Student Health Insurance	480
Library/Information Services fee	100
Arts and Culture fee	64
Athletics fee	130

Credits in excess of 15 will be billed at the per-credit rate listed for part-time registration. Enrollment at Kingston and CCE locations is combined when determining these fees. Dropping overload credit after the end of the add period does not reduce term bills.

Kingston and CCE Enrollment

All students who are full time because of combined enrollment at both the College of Continuing Education and the Kingston Campus (nine credits and over) are assessed the standard fees at the full-time rate when enrolled in at least five credits on the Kingston Campus. Students enrolled for less than five credits at the Kingston Campus are charged the fees at the part-time rate. Dropping courses at either location after the end of the add period does not reduce term bills.

Health Services Fee

All full-time graduate students, all international students and their spouses, and all graduate assistants and graduate research assistants are required to participate in the University Health Services plan and accompanying Student Health Insurance plan. With the exception of international students and their spouses, the Student Health Insurance plan may be waived if evidence of comparable coverage in another plan is provided and if the student completes, signs, and returns a waiver card to University Health Services prior to the end of the add period (the first two weeks of school). Unless the insurance is waived, the student will be billed. Waiver forms may be obtained directly from Health Services. Part-time students and spouses of students are eligible to participate in the health and insurance plans on an optional basis.

Part-Time, One Semester

Students registered for eight credits or less are charged the following fees:

Tuition, per credit hour	
Rhode Island residents	$175
Regional students	263
Out-of-state residents	430
Registration fee	20
Graduate student assessment	1
Memorial Union fee (per credit)	8
Library/Information Services fee (per credit)	4
Arts and Culture fee (per credit)	3

FEES AND FINANCIAL AID

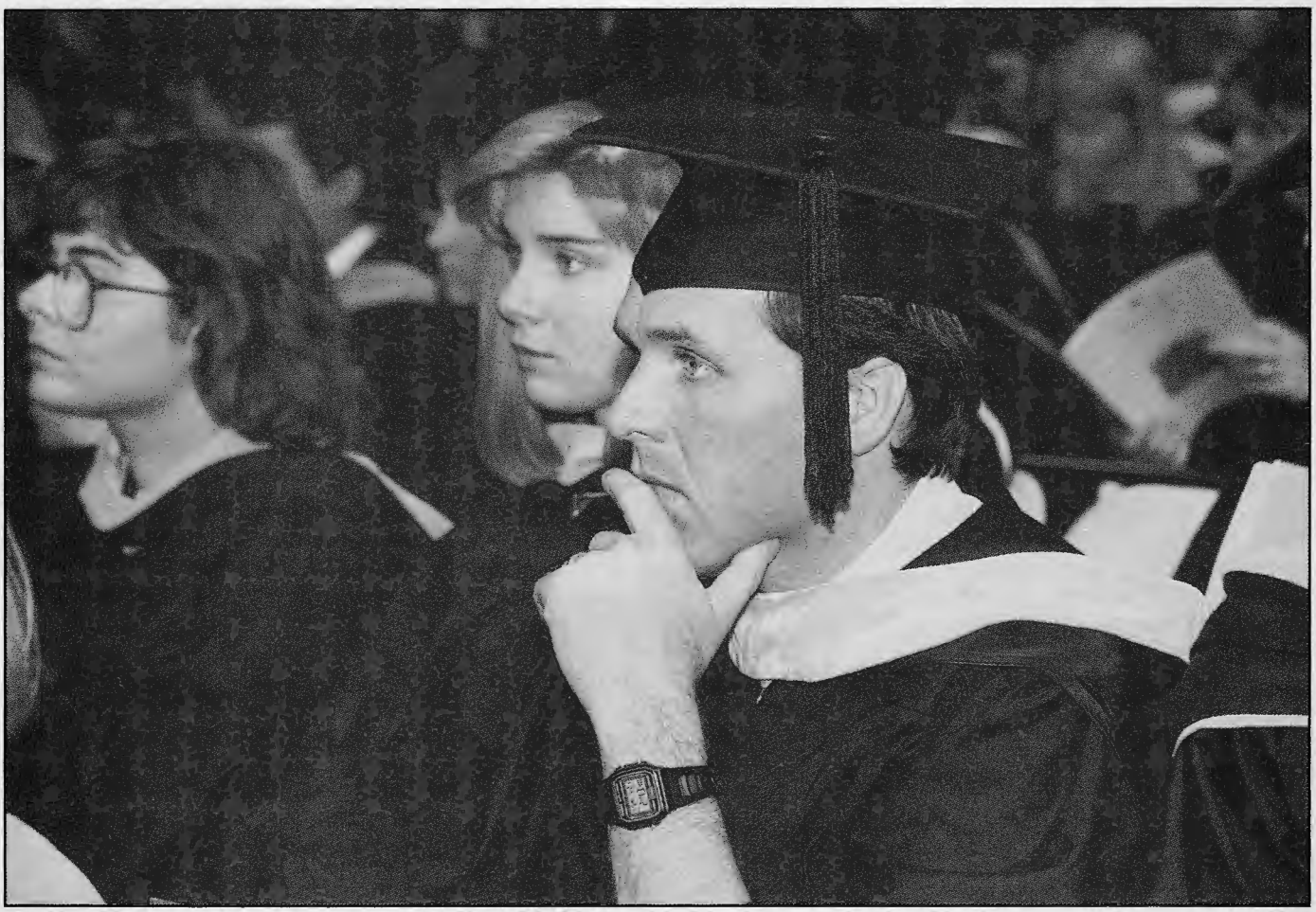
Tuition, fees, and policies set forth in this bulletin are subject to change without notice.

Tuition and fees for graduate students vary according to whether or not the student is a legal resident of the state of Rhode Island and whether the student is enrolled in full-time or part-time study. All charges are payable by the semester and are due and payable upon receipt of the bill or by the due date indicated on the bill.

The Dean of the Graduate School classifies each student admitted to the University as a resident or nonresident student on the basis of all relevant information available to him and in compliance with the stated policy of the Board of Governors for Higher Education. A Certificate of Residence is included in the self-managed application package. It must be filed by residents of Rhode Island and by New England Regional Students; failure to file the affidavit will result in automatic classification as an out-of-state student. Forms for reclassification as a Rhode Island resident student are available in the Graduate School Office. A student may appeal the decision to the Board of Residence Review.

New England Regional Student Program. Under the provisions of the New England Regional Student Program for graduate students administered by the New England Board of Higher Education, the University charges a regional student rate (150 percent of Rhode Island resident tuition) to residents of other New England states who are matriculated graduate students in certain programs. The specific program must be one that has been designated *not available* by the student's home-state institutions of higher education, and must have been declared open to regional students by the University of Rhode Island. Students must apply through the Graduate School and must file a Certificate of Residence signed by the clerk of the city or town where they claim legal residence. This form is included in the application package. Determination of regional status is made by the Graduate School, which will inform the applicant of the final decision. If a student transfers to another program, the regional student status is automatically terminated. Where appropriate, the student may apply for regional student status in the new program.

Normally, these programs are listed in the New England Regional Student Program graduate-level booklet. Inquiries and requests for further information can be directed to the Dean of the Graduate School at the University of



Late Registration. Students are expected to register for courses before classes begin. Those who are unable to do so may enroll as late registrants in the Office of the Registrar during the first two weeks of classes. A late registration fee will be charged unless it is waived by the Office of the Registrar.

Schedule of Courses. The *Schedule of Courses* is published in March for the fall semester and in October for the spring semester. It is available in the Office of the Registrar. The University reserves the right to cancel courses offered in the *Schedule of Courses*.

Payment of Fees. Arrangements must be made with the Bursar for complete and timely payment of tuition and/or fees. If during the semester it becomes apparent that a student has not met his or her financial responsibilities to the University, registration for that semester is subject to immediate cancellation.

Drop and Add. Students are permitted to drop courses and add courses with subsequent reassessment of fees (see page 22) during the first two weeks of classes. The final day to drop courses without a grade is midsemester. However, fees are not reassessed for courses dropped after the second week of classes.

Change of Address. It is the responsibility of the student to complete a change of address form in the Office of the Registrar whenever a change is made in the local, campus, or mailing address.

Summer Session. Although some graduate-level courses are offered during the summer sessions, the University does not guarantee that any particular course will be offered. The availability of individual faculty members to supervise research or to participate in comprehensive examinations and in examinations in defense of theses or dissertations during the summer sessions varies from year to year. During the summer sessions, special arrangements must be made with both the Graduate School and the department for scheduling comprehensive examinations and thesis or dissertation defenses. Graduate students must make prior individual arrangements for taking directed studies or special problems courses.

Time Limit and Continuous Registration. Graduate students are expected to complete their course work and research within the four-year time limit prescribed for the master's degree and the seven-year time limit for the doctorate.

The time limit for a degree program may be extended by applying to the Dean of the Graduate School for legitimate reasons such as military service or serious illness. This request requires the endorsement of the student's major professor or department chairperson.

Graduate students must remain continuously enrolled, except for summer sessions, which are optional, until they have completed all requirements and have received their degree. Students who wish to maintain graduate status but are not registered for course work or research and are not on a leave of absence approved by the department and the Dean of the Graduate School must pay the continuous registration fee each semester until the degree has been awarded.

Students who are on a leave of absence or are signed up for continuous registration do not have the privileges of consulting regularly with faculty on research or thesis preparation nor of using laboratory, computer, or other educational facilities at the University.

A student who does not register for a semester, or obtain approval for a leave of absence, will be considered as having voluntarily withdrawn from the University. Students who are later permitted to re-enroll must pay the CRG fee for each semester in which they did not maintain graduate status.

Full-Time and Part-Time Students. Minimum full-time registration is nine credit hours during a regular semester and six credit hours during a summer session. Maximum registration of 15 credit hours during a regular semester and eight credits during each summer term may not be exceeded without prior written permission of the Dean of the Graduate School, based on extraordinary circumstances. Credits in excess of 15 will be billed at the per-credit rate. Full-time registration is required of all international students and of all students holding fellowships, assistantships, full scholarships, and traineeships administered by the University. Students who do not meet the minimum full-time registration requirement are considered part-time students.

Credits Earned Off Campus. Students who wish to register for credits to be counted toward a degree, and who will be earning these credits through off-campus activities such as research or independent study at a national laboratory, are required to obtain prior approval from the Dean of the Graduate School and to have these activities listed as part of their programs of study.

Intellectual Opportunity Plan (Pass-Fail Option). To allow graduate students to venture into new areas of knowledge without fear that their scholastic average will suffer, the Graduate Council has approved the Intellectual Opportunity Plan. (Please note that courses below the 400 level are automatically excluded from the scholastic average.) To be eligible for this option, the student's major professor or advisor must certify that the course or courses are outside the student's major field of study, are not entrance deficiencies, and are not specific requirements of, but are relevant to, the student's program. A maximum of four credits may be taken by the master's degree candidate and a maximum of eight credits, including any taken as a master's candidate, by the doctoral candidate.

Audit. Courses may be audited with the approval of individual course instructors and by presenting an auditor's card obtained from the Office of the Registrar. An auditor receives no course grade; consequently, an audited course does not count as part of the student's course load for registration purposes, does not appear on the transcript, and cannot count as work taken toward completion of residence requirements. A student must be enrolled in at least one other course to be permitted to audit a course.

Required Identification. In order to obtain a University ID card and to be certified for employment, students must have in their possession a photo identification card, such as a driver's license, and a certified copy of their birth certificate. A valid passport will serve both of these purposes.

specified deadlines will be processed in time for enrollment in the desired semester. Admission is valid only for the term offered and must be reconsidered if a postponement is subsequently requested.

International Applicants. Applicants from foreign countries must complete the Test of English as a Foreign Language (TOEFL) with a minimum score of 550 unless a higher minimum is listed under the admission requirements for the specific program. Self-administered international application forms can be obtained from the Graduate Admissions Office. The completed application package must be returned directly to the department or program to which admission is sought. Inquiries from international students concerning nonimmigrant visas, transfers, funding, etc., should be sent to the Office of International Students and Scholars. On- and off-campus housing inquiries should be sent to the Office of Housing and Residential Life.

Transfer Credit. Transfer credit can be requested for graduate work taken at other accredited institutions of higher learning. Such credits may not exceed 20 percent of the total credits required for the program. Doctoral candidates holding a master's degree in the same or a closely related area can request up to 30 credits. The transfer work must have been taken at the graduate level (equivalent to the 500 level or higher in the University of Rhode Island course-numbering system) and a passing grade earned at that institution. It must have been completed not more than five years prior to the date of request for transfer into a master's program (ten years for the doctoral program) and must have a clear and unquestioned relevance to the student's program of study. The request for transfer credit should be accompanied by a proposed program of study and must have the approval of the student's major professor and the Dean of the Graduate School. If transfer credit is desired for work taken elsewhere after a graduate student is enrolled at the University, *prior approval* must be obtained from the Dean of the Graduate School.

Degree Candidates. Applicants must forward directly to the department to which admission is being sought the completed self-managed application package, containing all of the requested materials. Where required, test scores in the appropriate nationally administered tests should be sent directly to the department by the testing service. Tests required for specific programs can be found in the section "Graduate Programs." Scores (GRE, MAT, or GMAT) which were earned more than five years prior to the term of application will not be accepted. If test results exceed the five-year limit, applicants must retake the examination.

To be accepted as graduate degree candidates, applicants must have maintained an average of approximately B (3.00 on a 4.00 scale) or better in their undergraduate work. For programs that require standardized tests, students must also have satisfactory scores on the appropriate nationally administered test. Applicants with undergraduate averages below the B level may possibly be admitted with submission of other evidence of academic potential; i.e., satisfactory performance in postbaccalaureate work, professional experience as evidenced by publications or letters of recommendation, and/or high scores in the standardized tests referred to above. All students are expected to maintain a cumulative average of B (3.00) or better. Students who do not maintain a cumulative B average will have their status reviewed and may be placed on provisional status or be dismissed. A student placed on provisional status must achieve a cumulative B average within one semester (or nine credits, if part time) or be subject to dismissal.

Advanced Standing. A maximum of 12 credit hours of work taken at the University of Rhode Island in nonmatriculating status may be applied toward degree requirements if the student is later admitted to a degree program, but only with the recommendation of the student's program committee and the approval of the Dean of the Graduate School. Advanced standing for work taken at another institution must also be included within this limit. The request should be accompanied by a proposed program of study and satisfy the time constraints listed for transfer credit.

In certain cases, applicants who have been denied admission may be advised to take several courses in nonmatriculating status (see the following paragraph) to provide a basis for later reconsideration of their applications. In such cases, these courses are usually regarded as though they were entrance deficiencies and are not accepted for advanced standing within minimum-credit programs of study.

Nonmatriculating Status. Individuals holding a bachelor's degree who are not candidates for an advanced degree may take courses during the academic year or in the summer in nonmatriculating status. Normally, to take courses for personal satisfaction or professional advancement, postbaccalaureate students enroll in the College of Continuing Education. Any nonmatriculated student wishing to take courses on the Kingston Campus must file an application with the Office of the Registrar. If nonmatriculated students later wish to be admitted to a degree program, they must complete the regular admission procedure.

Nonmatriculated students do not have the privileges regularly enjoyed by degree candidates. For example, on the Kingston Campus they may not register until one week before classes begin and must make payment before accessing the telephone registration system. Their enrollment is subject to the accommodation of degree candidates wishing to take these courses. In addition, there is a limit to the number of courses taken in this status that may be used as advanced standing to satisfy degree requirements. Nonmatriculated students are not eligible for financial aid.

Registration

The responsibility for being properly registered rests with the student. Students must complete their registration within the time period announced by the University. The chairperson of the student's major department will assign an advisor to assist the new graduate student in planning a program. All students must register for courses through the Office of the Registrar in order to be properly enrolled.

Early Registration. Matriculated (official degree-seeking) students who meet the eligibility requirements as defined in the *Schedule of Courses* generally register in March and October for the following semester. New and re-enrolling students will receive information concerning registration procedures. The *Schedule of Courses* is available at the Office of the Registrar.

ADMISSION AND REGISTRATION

Admission

Persons holding the baccalaureate degree from a recognized accredited institution and wishing to take graduate-level courses at the University may do so through admission to the Graduate School as degree candidates, or through postbaccalaureate work in nonmatriculating status (see page 19). Admission to the Graduate School is based on academic qualifications and potential without regard to age, race, religion, sex, national origin, disability, or sexual orientation.

A package of self-managed application materials can be obtained from the Graduate Admissions Office, University of Rhode Island, Quinn Hall, Kingston, RI 02881-0809. Zip code should be included in the applicant's return address. Inquiries concerning particular degree programs or courses of instruction should be addressed to the appropriate department chairperson or the Director of Graduate Studies as listed in the "Graduate Programs" section of this bulletin.

The completed application package must be returned directly to the department or program to which admission is sought. Final decision on admission rests with the Dean of the Graduate School, who, after considering the recommendation of the department concerned, will notify the applicant of his decision.

Where admission to a doctoral program is possible for those holding the bachelor's degree and meeting other requirements, the Graduate School reserves the right to offer admission only to the master's program while postponing a decision on admission to the doctoral program until at least a substantial portion of the master's work has been completed.

All applications must be accompanied by a nonrefundable application fee: $30 for in-state and $45 for out-of-state residents. Simultaneous application to more than one department requires duplicate applications and credentials and separate application fees.

The completed application package and all supporting documents must be received by April 15 for summer admission, July 15 for September admission, and November 15 for January admission. The application package must be received by February 1 for consideration for financial aid for the following year. As indicated in the "Graduate Programs" section in this bulletin, certain programs admit students only for September or they have earlier deadlines. There is no assurance that applications completed after

completion of a satisfactory dissertation; 6) the passing of a final oral examination in defense of the dissertation; and 7) fulfillment of the residence requirement of maintaining full-time residence for at least two consecutive semesters while acquiring the last 42 credits for the degree, but prior to taking the doctoral comprehensive examinations. Residence is interpreted as full-time attendance (nine credits or more) on campus or in the College of Continuing Education during a regularly scheduled semester. Full-time registration for both terms of a summer session counts as one semester of residence. With the exception of graduate assistants, instructors, research assistants, or the equivalent, no candidate for the doctorate may count part-time study toward satisfying this residence requirement unless a specific request for an exception, outlining the reasons and alternate method of satisfying the requirement, is approved by the candidate's doctoral committee and submitted together with the candidate's program of studies for the approval of the Dean of the Graduate School. The department in which the student studies for the doctoral degree may or may not require a master's degree preliminary to, or as part of, the regular course of study.

Qualifying Examination. This examination is intended to assess a student's potential to perform satisfactorily at the doctoral level. A student without a master's degree who is accepted as a doctoral candidate is expected to take a qualifying examination, usually after 24–30 credits have been completed. A student who holds a master's degree in the same or a closely related field is normally not required to take the examination. If an examination is required, it will be stipulated at the time of admission.

Research Competency. Each department, in cooperation with the Graduate School, is authorized to formulate and to amend its own requirements and methods of testing for competency in research tools such as foreign language(s), computer science, or statistics. The department may, in turn, delegate this responsibility to the program committee for each individual doctoral candidate.

Comprehensive Examination. Each doctoral candidate will take comprehensive examinations at or near but not later than 12 months after completion of the formal courses stipulated in the program of study. The examination is designed to assess the student's intellectual capacity and adequacy of training for scholarly research.

The comprehensive examination consists of two parts: written and oral. The student, with the approval of his or her program committee, applies to the Graduate School to take the examination. The oral examination committee includes the student's committee and two additional members of the graduate faculty appointed by the Dean of the Graduate School. One of the additional members represents a field of study allied to that of the student's major. The candidate's major professor arranges for and chairs the examination. Unanimous approval by the examining committee is required for the passing of the comprehensive examination.

A candidate whose performance fails to receive unanimous approval of either examining committee may, with the committee's recommendation and the approval of the Dean of the Graduate School, be permitted one re-examination in the part or parts failed, to be taken no sooner than 10 weeks and no later than one year after the initial examinations.

Final Oral Examination. This examination is a defense of the dissertation and is open to all members of the faculty and, generally, to all students. The examination, usually two hours long, is conducted by an examining committee comprised of the candidate's program committee and two additional graduate faculty members appointed by the Dean of the Graduate School. One of the appointed members will be designated by the Dean to chair the examination.

Unanimous approval of the examining committee is required for passing. If the candidate does not perform satisfactorily, the committee may recommend to the Dean of the Graduate School that the candidate take one re-examination under stated conditions.

Theses and Dissertations

For the oral defense, a sufficient number of completed copies of the thesis or dissertation, acceptable in form and substance to each member of the examining committee and the Dean of the Graduate School, is required. At least 20 calendar days prior to the proposed defense, the copies must be submitted to the Graduate School for scheduling of the examination.

Following a successful defense, and after all changes and corrections have been made, four copies prepared in accordance with requirements of the Graduate School and the library must be submitted to the Graduate School Office. Doctoral candidates must submit an additional abstract, not exceeding 350 words.

Students are advised to consult the *Statement on Thesis Preparation* and *Instructions for Thesis Defense,* both available in the Graduate School Office, and the most recent edition of Kate L. Turabian's *A Manual for Writers of Term Papers, Theses, and Dissertations,* published by the University of Chicago Press.

CHE Courses
Chemical Engineering

403, 404 (or OCE 403, 404) Introduction to Ocean Engineering Processes I, II *(I and II, 3 each)*
425 Process Dynamics and Control *(II, 3)*
437 Materials Engineering *(I and II, 3)*
438 Failure Analysis and Prevention *(II, 3)*
447 (or FSN 447) Food Engineering *(I, 4)*
464 Industrial Reaction Kinetics *(I, 3)*

501, 502 Graduate Seminar *(I and II, 1 each)* Seminar discussions including the presentation of papers based on research or detailed literature surveys. *(Seminar) Required of all graduate students, with a maximum of 1 credit per year allowed. May be repeated for a maximum of 2 credits. S/U credit.* Rose

513 Advanced Chemical Engineering Thermodynamics *(I, 3)* Applications of the first, second, and third laws of thermodynamics and their relation to chemical engineering processes. Emphasis on properties of fluids, chemical and physical equilibria, and refrigeration. *(Lec. 3) Pre: 313, 314 or equivalent, graduate standing, or permission of chairperson. In alternate years.* Estrin

530 Polymer Chemistry *(I, 3)* Polymer structure, molecular forces, glass and crystalline transitions, solution properties, polymerization kinetics, molecular weight distribution, fractionation, viscoelastic properties, and transport processes. *(Lec. 3) Pre: CHM 228 and CHE 332 or permission of instructor.* Barnett and Yang

531 Polymer Engineering *(I or II, 3)* Polymer processing and mechanical properties of plastics, fibers, and elastomers. *(Lec. 3) Pre: 348 or MCE 448 or permission of instructor.* Barnett

532 Ceramic Engineering *(I, 3)* Properties of ceramic materials as related to starting materials and forming, densification, and finishing processes. Emphasis on resulting phases and microstructure. Application of physical and chemical principles to tailor properties to engineering needs. *(Lec. 3) Pre: 437 or equivalent.* Rockett or Gregory

533 Engineering Metallurgy *(II, 3)* Structures and properties of metals and alloys required to meet typical engineering problems; proper selection of tool materials; properties of stainless steels; materials of special importance in nuclear fields, etc. *(Lec. 3) Pre: 333 or permission of instructor.* Brown

534 (or OCE 534) Corrosion and Corrosion Control *(II, 3)* Chemical nature of metals, electrochemical nature of corrosion. Types of corrosion, influence of environment, methods of corrosion control. Behavior of engineering materials in corrosion with emphasis on industrial and ocean environments. *(Lec. 3) Pre: permission of instructor.* Brown

535 (or OCE 535) Advanced Course in Corrosion *(I, 3)* High-temperature corrosion, oxidation by gaseous environments, industrial problems with high-temperature corrosion. Materials selection and techniques to combat high-temperature corrosion. *(Lec. 2, Lab. 3) Pre: 534 (or OCE 534) or permission of instructor.* Brown or Gregory

537 (or OCE 537) Advanced Materials Engineering *(II, 3)* Engineering properties, molecular design, and applications of materials. Synthesis, fabrication, and processing of materials. Effects of environment on materials, materials products, devices, and systems. *(Lec. 3) Pre: 437 and PHY 341.* Gregory

539 Electron and Light Microscopy of Solids *(I, 3)* Theory and physical principles governing the design and use of light and electron optical systems in identification, analysis, and structural characterization of metals, ceramics, polymers, glasses, and composites. Emphasis on polarized light and scanning electron microscopy. *(Lec. 3) Pre: 437 or equivalent. In alternate years.* Gregory or Rockett

540 Phase Equilibria *(II, 3)* Interpretation, construction, and thermodynamics of one, two, three to n-component phase diagrams with examples of their use in chemical, ceramic, metallurgical, and mineral engineering. *(Lec. 3) Pre: CHM 431 or equivalent.* Rockett

541 Transport Phenomena I *(I, 3)* Analysis of transport processes in fluids with emphasis on diffusion of matter. *(Lec. 3) Pre: 347, 348 or equivalent, graduate standing, or permission of chairperson.* Bose

542 Advances in Interfacial Phenomena *(I, 3)* Topics will include capillarity, surface tension; surface thermodynamics, electrical aspects of surface chemistry; contact angles and wettability; emulsions and foams; adsorption from solutions; hydrodynamic stability of interfaces. *(Lec. 3) Pre: CHM 431, 432 or equivalent, or permission of instructor.* Bose

548 (or FSN 548) Separations for Biotechnology *(II, 3)* A study of methods of concentration used in the biotechnology industries for production and isolation of products. *(Lec. 3) Pre: 348 or 447.* Barnett

560 Chemical and Physical Processes of Integrated Circuit Fabrication *(I, 3)* Chemical and physical processes used in the fabrication of integrated circuits and devices. Emphasis on crystal growth, oxidation, CVD, plasma processes, photochemical processes, solid-state diffusion, lithography, and their relation to device performance. *(Lec. 3) Pre: CHM 431, CHE 349, or equivalent.* Gregory

573 Mechanical Metallurgy *(I or II, 3)* Behavior and response of metals to mechanical plastic forming. Property control by analysis and design of industrial metal processing. Principles of annealing, forging, rolling, extruding, rod, wire, and tube drawing. Recent advances and developments. *(Lec. 3) Pre: permission of instructor.* Brown

574 Biochemical Engineering I *(I, 3)* Introduction to biotechnology. Includes properties of biological materials, dynamics, control, and operation of biological systems and processing of biological materials. *(Lec. 3) Pre: permission of instructor.* Rivero-Hudec

591, 592 Special Problems *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

614 Advanced Chemical Engineering Thermodynamics *(II, 3)* Continuation of 513. *(Lec. 3) Pre: 513.* Estrin or Lucia

641 Transport Phenomena II *(II, 3)* Steady, unsteady, and multidimensional heat conduction; convection. Mass transport at low and high fluxes; diffusion and chemitheory; approximate methods for heat and mass transfer problems. *(Lec. 3) Pre: 541 or permission of instructor.* Bose

643 Fluid Dynamics *(II, 3)* Advanced problem course dealing with isothermal and nonisothermal flow of compressible and incompressible fluids. *(Lec. 3) In alternate years.* Knickle

644 Process Heat Transfer *(II, 3)* Advanced study of heat transfer by conduction in the steady and unsteady state, radiation, and convection. *(Lec. 3) In alternate years.* Knickle

647 Mass Transfer I *(I, 3)* Advanced course dealing with the application of mass transfer theory in the distillation of binary, multicomponent, and complex mixtures. *(Lec. 3) In alternate years.* Gray

648 Mass Transfer II *(II, 3)* Advanced study of vapor-liquid equilibria and mass-transfer theory applied to gas-liquid systems; humidification and gas absorption, simple and multicomponent systems, with and without chemical reaction. *(Lec. 3)* Gray

664 Applied Reaction Kinetics *(II, 3)* Application of principles of chemical reaction kinetics to industrial processes. *(Lec. 3) In alternate years.* Staff

691, 692 Special Problems *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Chemistry

M.S., Ph.D.
401-792-2318

Graduate Faculty

Chairperson: Professor Wilfred H. Nelson, Ph.D., 1962, University of Minnesota
Professor Elie Abushanab, Ph.D., 1965, University of Wisconsin
Professor Christopher W. Brown, Ph.D., 1967, University of Minnesota
Professor Phyllis R. Brown, Ph.D., 1968, Brown University
Professor Clair J. Cheer, Ph.D., 1964, Wayne State University
Professor Joel A. Dain, Ph.D., 1957, Cornell University
Professor William B. Euler, Ph.D., 1979, Florida State University
Professor James L. Fasching, Ph.D., 1970, Massachusetts Institute of Technology
Professor Harold W. Fisher, Ph.D., 1959, University of Colorado
Professor David L. Freeman, Ph.D., 1972, Harvard University
Professor Louis J. Kirschenbaum, Ph.D., 1968, Brandeis University
Professor Raymond P. Panzica, Ph.D., 1972, University of Utah
Professor William M. Rosen, Ph.D., 1967, University of California, Riverside
Professor Yuzuru Shimizu, Ph.D., 1962, Hokkaido University
Professor Daniel D. Traficante, Ph.D., 1962, Massachusetts Institute of Technology
Professor Bruno M. Vittimberga, Ph.D., 1957, University of Illinois
Professor Sze Cheng Yang, Ph.D., 1973, Columbia University
Associate Professor Karen I. Peterson, Ph.D., 1982, University of Colorado, Boulder
Assistant Professor Cynthia G. Zoski, Ph.D., 1985, Trent University
Adjunct Professor Paul J. Berner, Ph.D., 1964, Stevens Institute of Technology
Professor Emeritus Paul I. Abell, Ph.D., 1951, University of Wisconsin

Specializations

Analytical chemistry: electrochemistry, vibrational spectroscopy, neutron activation analysis, high-performance liquid chromatography, laser spectroscopy.

Inorganic chemistry: light scattering, two-dimensional conductors, solution kinetics, organometallics, macrocyclic complexes, metal oxidation states.

Organic chemistry: carbohydrates, heterocycles, synthesis, electron transfer, reaction dynamics, geochemistry, structural analysis.

Physical chemistry: catalysis, molecular spectroscopy, theoretical chemistry, surface chemistry, conducting polymers, statistical mechanics.

Master of Science

Admission requirements: GRE only for graduates of non-U.S. universities, with advanced test strongly recommended. Preference is given to candidates with undergraduate majors in chemistry or chemical engineering with mathematics through calculus.

Program requirements: placement examination to determine specific program requirements, successful completion of master's qualifying examinations; for thesis option (31 credits), 12 credits of graduate core courses in at least three of the four areas of chemistry, one additional graduate-level course in chemistry, CHM 641 or 642, and thesis; for nonthesis option (36 credits), 18 credits of graduate core courses, CHM 641 or 642, CHM 551, 552, and a written comprehensive examination.

Doctor of Philosophy

Admission requirements: same as for master's degree.

Program requirements: successful completion of qualifying examination; 15 credits of graduate core courses, one additional graduate-level course in chemistry, and CHM 642–644 (3 credits). Comprehensive examination and dissertation.

CHM Courses
Chemistry

401 Intermediate Inorganic Chemistry *(I, 3)*
402 Physical Inorganic Laboratory *(II, 2)*
412 Instrumental Methods of Analysis *(II, 2)*
414 Instrumental Methods of Analysis Laboratory *(II, 2)*
425 Qualitative Organic Analysis *(I, 2)*
427 Intermediate Organic Chemistry *(I, 3)*
431 Physical Chemistry I *(I, 3)*
432 Physical Chemistry II *(II, 3)*
436 Laser Spectroscopy Laboratory *(II, 2)*

501 Advanced Inorganic Chemistry I *(I, 3)* Systematic analysis of bonding schemes and structural aspects of molecular systems encountered in inorganic chemistry. Special emphasis on electron density distributions, physical methods of analysis, and practical applications of quantum mechanics. *(Lec. 3) Pre: 401.* Euler

502 Advanced Inorganic Chemistry II *(II, 3)* Modern inorganic chemistry approached from experimental, theoretical, and descriptive points of view. Includes electronic structure and bonding in coordination chemistry, topology, thermodynamics of complex formation, mechanisms, lanthanides, and actinides. *(Lec. 3) Pre: 401 or equivalent.* Kirschenbaum

504 Physical Methods of Inorganic Chemistry *(II, 3)* Theory and application of numerous experimental techniques used for the elucidation of molecular and electronic structure of inorganic molecules. Primary emphasis is on nuclear magnetic resonance, optical, infrared, Raman, and electron paramagnetic resonance spectroscopies. *(Lec. 3) Pre: 401 or permission of instructor.* Euler

511 Advanced Analytical Chemistry I *(I, 3)* Fundamentals of electrochemistry, including a review of electricity and how it passes through conductors, electrochemical cells, electrode reactions, ionic solutions, polarization, transport mechanisms, voltammetry. Statistical treatment of experimental data. *(Lec. 3) Pre: 412 or permission of instructor.* Zoski

512 Advanced Analytical Chemistry II *(II, 3)* Fundamentals of chromatographic and electrophoretic separations and major spectroscopic techniques. Basic theory, instrumentation, advantages, limitations, and applications of these techniques as well as new instrumental developments are discussed. *(Lec. 3) Pre: 412, PHY 340, and MTH 243.* P. Brown

518 Radiochemistry *(II, 3)* Theory and principles of nuclear science as applied to the various fields of chemistry. Radioactivity, radiation detection and measurement, preparation and separation of radionuclides, emphasis on solution of chemical and environmental research problems with the tech- niques of nuclear chemistry. *(Lec. 3) Pre: 432, PHY 214, or permission of instructor.* Fasching

519 Theoretical Concepts in NMR *(I, 3)* The physical concepts of NMR phenomena are presented, beginning with signals generated in the probe, carried through the spectrometer console, into the computer, and finally represented as a spectrum. *(Lec. 3) Pre: 292, PHY 112, and MTH 141, or equivalents, or permission of instructor.* Traficante

520 Interpretation of One-Dimensional NMR Spectra *(II, 3)* Uses of chemical shifts and coupling constants are presented for interpreting one-dimensional (1D) proton and carbon spectra. Includes relaxation time measurements, decoupling, and simple 2D interpretation. *(Lec. 3) Pre: 292, PHY 112, and MTH 141, or equivalents, or CHM 519 or permission of instructor.* Traficante

521 Advanced Organic Chemistry I *(I, 3)* Emphasis on fundamental organic structure theory and reaction mechanisms. *(Lec. 3) Pre: 226 and 228 or equivalent.* Vittimberga

522 Advanced Organic Chemistry II *(II, 3)* Modern synthetic reactions and their application to such areas as natural products. *(Lec. 3) Pre: 521 or permission of instructor.* Rosen

524 Interpretation of Two-Dimensional NMR Spectra *(II, 3)* Covers the theoretical and practical aspects of two-dimensional (2D) NMR. Includes pulse sequences, instrument set-up, and chemical applications. *(Lec. 3) Pre: 519 and 520 or permission of instructor.* Traficante

531 Advanced Physical Chemistry I *(I, 3)* Principles and applications of chemical thermodynamics and chemical statistical thermodynamics. Includes the three laws of thermodynamics, statistical distributions, statistical thermodynamic ensembles and fluctuations. Applications to ideal gases and crystals, real fluid, and chemical equilibrium. *(Lec. 3) Pre: 432 or permission of instructor.* Yang

532 Advanced Physical Chemistry II *(II, 3)* Principles and applications of quantum chemistry. Includes the formal development of quantum theory and applications to electronic structure as well as other problems of chemical interest. *(Lec. 3) Pre: 432 or permission of instructor.* Yang

551, 552 Nonthesis Master's Research *(I and II, 3 each)* Research on original problem for fulfillment of research requirement of nonthesis master's degree. Literature survey, laboratory work, and detailed report required. *(Independent Study) Pre: permission of chairperson.*

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. A minimum of 6 credits is required of students who have chosen the thesis option for the master's degree. *(Independent Study) S/U credit.*

608 Inorganic Reaction Mechanisms *(I or II, 3)* Kinetics and mechanisms of reactions in aqueous solution: techniques, results, and theoretical interpretation. Instrumentation for studying rapid reactions in solution, relaxation methods, electron transfer rates, hydrolytic and solvolytic reactions, metal ion complexation, reactions of biochemical significance. *(Lec. 3) Pre: 502 or permission of instructor. Next offered fall 1995.* Kirschenbaum

616 Applied Analytical Techniques *(II, 3)* Application of analytical instrumentation and techniques to practical problems. Limitations and specific difficulties of analyzing complex matrices in practical research. Problem-oriented presentation. *(Lec. 3) Pre: 511 and 512 or permission of instructor.* P. Brown

617 Advanced Instrumentation *(II, 3)* Basic design and theory of instrument design. Discussion of advantages and limitations of specific instruments. Current research in instrument design and critical evaluation of designs. *(Lec. 3) Pre: 511 and ELE 220 or 537 or its equivalent.* Staff

618 Theory of Separations *(II, 3)* Companion to 616. In-depth presentation of theory of separation processes. Emphasis on methods development, advanced topics, and current advances using gas and liquid chromatography. *(Lec. 3) Pre: 511 or permission of instructor.* P. Brown

621 Advanced Topics in Physical Organic Chemistry *(I, 3)* Mechanistic aspects of organic chemistry: molecular orbital theory, thermal and photochemical cycloadditions and rearrangements. Consideration of carbenes, nitrenes, and free radicals. Evaluation of steric, steroelectronic, and secondary orbital effects. *(Lec. 3) Pre: 521 and 522 or permission of instructor.* Staff

623 Advanced Topics in Synthetic Organic Chemistry *(I, 3)* Advanced topics in the synthetic aspects of organic chemistry. Synthetic reactions and techniques, strategies, and design. Conformational and stereochemical analyses, asymmetric synthesis, and natural product syntheses. *(Lec. 3) Pre: 521 and 522 or permission of instructor.* Staff

636 Advanced Topics in Physical Chemistry *(II, 3)* Advanced topics in quantum chemistry and statistical thermodynamics. Time-dependent and independent perturbation theory, interaction of light with matter, electronic structure of atoms and molecules, Hartree-Fock theory, classical and quantum statistical mechanics. *(Lec. 3) Pre: 531, 532, or permission of instructor.* Freeman

642, 643, 644 Graduate Seminar *(I and II, 1 each)* Results of detailed literature surveys are presented orally and in writing. Required for candidates for advanced degrees in chemistry. *(Seminar) S/U credit.* Staff

691 Special Topics *(I and II, 1–3)* Covers the following special research interests: a) carbohydrate chemistry, b) chemical kinetics, c) clinical chemistry, d) computer techniques in analytical chemistry, e) forensic chemistry, f) free-radical rearrangements, g) recent advances in analytical chemistry, h) light scattering, i) molecular orbital theory, j) pericyclic reactions, k) surface chemistry, l) X-ray analysis of organic molecules. *(Independent Study) Pre: permission of instructor. May be repeated for a maximum of 6 credits.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 (or EDC 930) Workshop in Chemistry Topics for Teachers *(I and II, 0–3)* Especially designed for teachers of physical sciences. Basic topics of chemistry from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Peterson, Yang, Euler, and Long

Civil and Environmental Engineering

M.S., Ph.D.
401-792-2692

Graduate Faculty

Chairperson: Professor Daniel Urish, Ph.D., 1978, University of Rhode Island; P.E.
Director of Graduate Studies: Associate Professor George E. Veyera, Ph.D., 1985, Colorado State University
Professor William D. Kovacs, Ph.D., 1968, University of California, Berkeley; P.E.
Professor Kang W. Lee, Ph.D., 1982, University of Texas, Austin; P.E.
Professor Everett E. McEwen, D.Eng., 1964, Rensselaer Polytechnic Institute
Professor Calvin P. Poon, Ph.D., 1964, University of Illinois; P.E.
Professor Armand J. Silva, Ph.D., 1965, University of Connecticut; P.E.
Professor Raymond M. Wright, Ph.D., 1981, Pennsylvania State University; P.E.
Associate Professor Dimitrios Karamanlidis, D.Eng., 1979, Technical University of Berlin
Associate Professor Alan S. Marcus, Ph.D., 1969, University of Massachusetts
Associate Professor Leon T. Thiem, Ph.D., 1982, University of Missouri; P.E.
Associate Professor George Tsiatas, Ph.D., 1984, Case Western Reserve University
Adjunct Professor Thomas E. Wright, M.S.E., 1975, West Virginia University; P.E.
Adjunct Associate Professor Michael C. Apostal, Ph.D., 1974, State University of New York, Buffalo
Adjunct Associate Professor Robert B. Shaw, M.S., 1966, Purdue University; P.E.
Adjunct Assistant Professor Eid Alkhatib, Ph.D., 1986, University of Rhode Island
Adjunct Assistant Professor Diane L. Badorek, Ph.D., 1982, University of Missouri; P.E.

Specializations

Environmental engineering: water supply and treatment facilities, municipal and industrial waste treatment, flocculation and coagulation of wastes, pollution of marine sediments, solid waste management, modeling of environmental systems, groundwater pollution, groundwater exploration, coastal groundwater, nonpoint source pollution, stormwater management, river and estuary hydrology.

Geotechnical engineering: properties of marine sediments, sediment sampling, in situ testing, deep-sea sedimentary processes, sediment transport, creep processes, environmental geotechnology, dredge material disposal, experimental geomechanics, soil-structure interaction, constitutive modeling of geological materials, particulate mechanics, application of nonlinear finite element and discrete element methods to geomechanics problems, earthquake engineering, dynamic soil properties, liquefaction, geosynthetics.

Structural engineering: matrix and finite element analysis, computer and numerical methods, marine structures, structural stability, thin-walled structures, coastal structures, deterministic and stochastic structural dynamics, structural reliability, vibration control, earthquakes, soil-structure interaction, condition assessment and rehabilitation of bridges.

Transportation engineering: properties of pavement materials, pavement theory and design, pavement management system, highway location, and geometric design. For master's level only: traffic operation and control, transportation cost, transportation supply and demand analysis, and transportation system analysis.

Master of Science

Admission requirements: bachelor's degree in civil or environmental engineering. Candidates in other engineering fields or in mathematics, biology, chemistry, or physics may be accepted with the possibility of additional undergraduate prerequisite courses being required.

Program requirements: thesis or nonthesis option. Thirty credits plus CVE 601, 602 except for part-time students. Nonthesis option requires comprehensive technical report and written comprehensive examination.

Doctor of Philosophy

Admission requirements: master's degree in civil or environmental engineering or in a related field.

Program requirements: 24 credits including the two-course minor outside the candidate's area of specialization, where required by the candidate's committee; comprehensive examination; and dissertation. Although there is no formal departmental language requirement, the candidate's committee may require proficiency with a research tool or in a foreign language.

CVE Courses
Civil and Environmental Engineering

442 Traffic Engineering *(I, 3)*
446 Transportation Engineering *(II, 3)*
453 Computer Analysis of Structures *(I, 3)*
470 Water and Wastewater Transport Systems I *(II, 3)*
471 Water and Wastewater Treatment Systems II *(I or II, 3)*
472 Industrial Air Pollution *(I or II, 3)*
474 Water Quality Sampling and Analysis *(II, 3)*
475 Water in the Environment *(II, 3)*
478 Hazardous Waste Disposal and Solid Waste Management *(I or II, 3)*
483 (or OCE 483) Foundation Engineering *(II, 3)*
485 (or GEL 485) Engineering Geophysics *(II, 3)*
491, 492 Special Problems *(I and II, 1–6 each)*
495 Civil and Environmental Engineering Systems *(I, 3)*

545 Pavement Design *(I, 3)* Pavement types; pavement system components; stresses in the pavement structure. Design factors and criteria, pavement stabilization, structural design of flexible and rigid pavements for highways and airports, pavement maintenance and overlay design. *(Lec. 3) Pre: 347 or equivalent. Offered in fall of odd-numbered years.* Lee and Kovacs

546 Urban and Rural Transportation
See Community Planning 546.

547 Geometric Design of Highways *(I, 3)* Evaluation of alternative designs. Criteria and practices of geometric design; at grade intersections, interchanges, channelization, weaving parking facilities, and road appurtenances; safety considerations, lane balancing, ramps, and terminals. *(Lec. 3) Pre: 347 or equivalent. Offered in fall of even-numbered years. Next offered fall 1994.* Lee

548 Pavement Materials and Mix Design *(II, 3)* Surficial soils. Material characterization and testing; elastic, viscoelastic, and plastic behavior. Fracture, fatigue, and rutting; design of bituminous mixtures. Other pavement materials and additives. Pavement recycling. *(Lec. 2, Lab. 3) Pre: 347 or equivalent. Offered in spring of even-numbered years. Next offered spring 1996.* Lee

551 Finite Element Analysis in Civil Engineering I *(I or II, 3)* Direct stiffness method. Rayleigh-Ritz and Galerkin methods. Isoparametric elements. Frames, trusses, plane stress and strain. Bending of thin plates. *(Lec. 3) Pre: 453 or permission of instructor.* Staff

556 Variational Methods in Structural Engineering *(I, 3)* Introduction; principle of minimum potential energy; principle of minimum complementary energy; generalized variational formulations; principles with relaxed continuity requirements; application to structures, and soils. *(Lec. 3) Pre: 453 or permission of instructor. Offered every fourth year. Next offered fall 1996.* Karamanlidis

560 Structural Design *(I or II, 3)* Behavior and design of structural systems, selected topics in steel, reinforced concrete, and prestressed concrete. *(Lec. 3) Pre: 460 and 465. Offered every third year. Next offered spring 1996.* McEwen, Marcus, and Tsiatas

561 Advanced Steel Design *(I, 3)* Selected topics in structural steel design following the LRFD specification, including plate buckling and postbuckling, torsion, plate girders, plastic design, frame stability, tall buildings, composite design, and earthquake-resistant design. *(Lec. 3) Pre: 460 or permission of instructor. Offered in alternate years. Next offered fall 1994.* Tsiatas

565 Structural Dynamics *(I or II, 3)* Simplified models and their equations of motion; analytical solution methods; Fourier analysis; Duhamel integral; nonlinearities; computer-oriented solution algorithms and their implementation. Applications. *(Lec. 3) Pre: 453. In alternate years. Next offered fall 1995.* Staff

568 (or MCE 568) Theory of Plates *(I or II, 3)* Development of basic plate equations. Classical solution examples of rectangular and circular plates. Additional topics selected from: orthotropic plates, large deflections, finite element, and numerical solutions. *(Lec. 3) Pre: 220 and MTH 244.* Karamanlidis and Nash

570 Sanitary Chemistry *(I, 3)* Application of analytical chemistry to analysis of natural waters; physical chemistry and organic chemistry of aqueous media; chemical principles applicable to operations of sanitary engineering. *(Lec. 3) Pre: permission of instructor.* Thiem

571 Sanitary Chemistry Laboratory *(II, 3)* Applications of chemical laboratory procedures to control of water and wastewater treatment processes. *(Lab. 9) Pre: 570.* Thiem

572 Biosystems in Sanitary Engineering *(I or II, 3)* Microorganisms which constitute the biological systems in water pollution, water purification, and wastewater treatment. Application of principles of microbiology and biochemistry to analysis and design in fields of sanitary engineering and water resources. *(Lec. 3) Pre: permission of instructor.* Poon

573 Theory of Water Purification and Treatment *(I, 3)* Principles of modern water purification and engineering practices. Aeration, deodorization, sterilization, coagulation, filtration, water softening, iron removal, disinfection, and corrosion control. *(Lec. 3)* Thiem

575 Open-Channel Hydraulics *(I or II, 3)* Analysis of uniform, critical, varied flow, and unsteady flow in open channels. Principles will be applied to open-channel design. *(Lec. 3) Pre: MCE 354.* Wright

581 (or OCE 581) Experimental Geomechanics *(I or II, 3)* Advanced methods and techniques of geotechnical testing. Behavior of granular and cohesive soils with determination of engineering properties. Interpretation, evaluation, and engineering applications of test data. Emphasis on shearing strength, consolidation, bearing capacity, earth pressures, seepage, and slope stability. *(Lec. 3) Pre: 381 or equivalent.* Kovacs, Silva, and Veyera

582 Seabed Geotechnics
See Ocean Engineering 582.

583 (or OCE 583) Advanced Foundation Engineering *(I or II, 3)* Applications of soil mechanics principles to analysis and design of pile foundations, drilled piers, flexible retaining structures, braced excavations, cofferdams, miscellaneous advanced foundation problems. *(Lec. 3) Pre: 381 or equivalent. Offered in fall of even-numbered years. Next offered fall 1996.* Kovacs, Silva, and Veyera

584 Designing with Geosynthetics *(I or II, 3)* Overview of geosynthetic materials, properties, test methods, and current standards. Design methods involving geotextiles, geogrids, geonets, geomembranes, and geocomposites. Applications to problems in geomechanics, geo-environmental engineering, and transportation-related fields. *(Lec. 3) Pre: 381 or equivalent.* Veyera

585 Soil Dynamics *(I or II, 3)* Vibration characteristics, wave propagation in soils, foundation vibration theory, foundation design for vibrating loads, vibration isolation, blast vibrations, dynamic soil properties, liquefaction potential, vibratory and dynamic compaction, computer implementation. *(Lec. 3) Pre: 483 or equivalent. Offered in spring of odd-numbered years. Next offered spring 1995.* Kovacs and Veyera

587 Groundwater Flow and Seepage Pressures *(II, 3)* Hydrodynamics of fluid flow through porous media. Analytical methods for steady and unsteady seepage in aquifers; theoretical analysis with practical modification of seepage problems involving foundations, drainage structures, earth dams, and dewatering. *(Lec. 3) Pre: 381 and permission of instructor. Offered in spring of odd-numbered years. Next offered spring 1995.* Urish and Kovacs

588 Groundwater Hydrology *(II, 3)* Quantitative methods of groundwater hydrology including determination of aquifer properties and yield. Modeling of groundwater systems for management quantity of water, movement of contaminants, and well design. Field and laboratory measurements. *(Lec. 3) Pre: MCE 354 and CVE 381 or equivalent. Offered in spring of even-numbered years. Next offered spring 1996.* Urish

591 Special Problems *(I, 1–6)* Advanced work under supervision of a staff member arranged to suit individual requirements of the student. *(Independent Study) Pre: permission of chairperson.* Staff

592 Special Problems *(II, 1–6)* Advanced work under supervision of a staff member arranged to suit individual requirements of the student. *(Independent Study) Pre: permission of chairperson.* Staff

596 Numerical Methods in Structural Engineering *(I or II, 3)* Methods of successive approximations and numerical procedures in the solution of stress, vibration, and stability problems in structural members. Nonuniform members, elastic supports, plates, torsion. *(Lec. 3) Pre: permission of chairperson. Offered in spring of even-numbered years. Next offered spring 1996.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

601, 602 Graduate Seminar *(I and II, 1 each)* Discussions and presentation of papers based on research or detailed literature surveys. *(Seminar) Required of all graduate students, with a maximum of 1 credit per year allowed. May be repeated for a maximum of 2 credits.* Staff

641 Pavement Evaluation and Rehabilitation *(II, 3)* Pavement performance concepts. Criteria for pavement evaluation. Measurement of pavement distress and structural capacity. Analysis and interpretation of pavement evaluation data. Correlation of data with performance ratings. Formulation and evaluation of maintenance and rehabilitation alternatives. *(Lec. 3) Pre: 545 or equivalent. Offered in spring of odd-numbered years. Next offered spring 1995.* Lee

655 Finite Element Analysis in Civil Engineering II *(I, 3)* Isoparametric models for three-dimensional continua, hierarchical elements. Reduced integration concepts, penalty method, discrete Kirchhoff method. Eulerian, total, and updated Lagrangian formulations. *(Lec. 3) Pre: 551 or permission of instructor. Offered in fall of even-numbered years. Next offered fall 1994.* Staff

657 Structural Stability *(II, 3)* Introduction; principal forms of equilibrium paths and their stability; conservative elastic systems; buckling of prismatic members; imperfections; plastic deformations; postbuckling of frames and reticulated structures; numerical methods; catastrophe theory. *(Lec. 3) Pre: 556 or permission of instructor.* Karamanlidis, McEwen, and Tsiatas

665 Advanced Topics in Structural Dynamics *(I or II, 3)* Equations of motion of systems and continuous bodies; analytical and numerical solution methods; large deflections and plasticity; time-stepping algorithms; active control of tall buildings; earthquake resistant structures; applications. *(Lec. 3) Pre: 565. Offered every third year. Next offered spring 1996.* Karamanlidis, McEwen, and Tsiatas

667 Probabilistic Methods in Structural Engineering *(I or II, 3)* Probabilistic applications in structural analysis and design. Statistical models for forces and material strengths. Component and system structural reliability. Random vibration applications in structural engineering. *(Lec. 3) Pre: introductory course on probability and 565 or OCE 522, or permission of instructor.* Tsiatas

668 Theory of Shells
See Mechanical Engineering 668.

672 Water Pollution Control and Treatment of Wastewater *(I or II, 3)* Wastewater characteristics, effects, and purification in natural water, government control strategies and impacts, cost of control, theory and mathematical concepts of secondary and tertiary treatment process, their limitations, and late developments. *(Lec. 3) Pre: one year of chemistry and biology, MTH 243 and CVE 572 or their equivalents, and permission of instructor.* Poon

677 Stream and Estuarine Analysis *(I or II, 3)* Fundamentals and mathematical concepts of physical and biological factors applied to the evaluation of the pollution capacity of streams and estuaries. *(Lec. 3) Pre: MTH 244.* Wright

681 Advanced Geotechnical Engineering I *(I or II, 3)* Advanced study of geotechnical principles and theory. Physical and chemical properties of soils; particulate mechanics; effective stress principle; permeability; steady-state and transient seepage; consolidation; stress distribution; miscellaneous topics. *(Lec. 2, Lab. 3) Pre: 381 or equivalent and permission of instructor.* Kovacs, Silva, and Veyera

682 Advanced Geotechnical Engineering II *(I or II, 3)* Advanced study of geotechnical engineering principles and theory. Stress-strain behavior; constitutive relationships; failure theories; applications of theories of elasticity, viscoelasticity, and plasticity; shear strength of sands; shear strength of clays; slope stability analysis; miscellaneous topics. *(Lec. 3) Pre: 381 or equivalent and permission of instructor.* Kovacs, Silva, and Veyera

687 Geotechnical Earthquake Engineering *(I, 3)* Seismology and seismicity; surface faulting and ground motion characteristics; response spectra; dynamic soil properties; dynamic response of soil layers, embankments, and slopes; influence of local soil conditions on site response; evaluation of design earthquakes; response analysis. *(Lec. 3) Pre: 483.* Kovacs, Tsiatas, or Veyera

688 Marine Geomechanics
See Ocean Engineering 688.

691, 692 Special Problems *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Clinical Laboratory Science

M.S.
401-792-2205

Graduate Faculty

Chairperson: Professor David C. Laux, Ph.D., 1971, University of Arizona
Director of Graduate Studies: Gregory E. Paquette, Ph.D., 1992, University of Rhode Island
Professor Norman A. Campbell, Ph.D., 1972, University of Wisconsin
Professor Albert H. Taubman, Ph.D., 1971, University of Pittsburgh
Professor George C. Tremblay, Ph.D., 1965, St. Louis University
Associate Professor John Boulmetis, Ph.D., 1982, Ohio State University
Associate Professor Jay F. Sperry, Ph.D., 1974, University of Kansas
Adjunct Professor Michael Sheff, Ph.D., 1957, Sheffield University
Adjunct Professor Kurt Stottmeier, Ph.D., 1962, University of Berlin
Adjunct Professor Burrows T. Younkin, Ph.D., 1981, Columbia Pacific University

Adjunct Associate Professor Barbara E. Barker, Ph.D., 1965, University of Rhode Island
Adjunct Associate Professor Jacob A. Canick, Ph.D., 1972, University of Rhode Island
Adjunct Associate Professor Steven Opal, M.D., 1976, Albany Medical College
Adjunct Associate Professor Charles Seymour, Ph.D., 1975, Cornell University
Adjunct Assistant Professor Edward Balkovic, Ph.D., 1984, Baylor College of Medicine
Adjunct Assistant Professor Julia E. Blazek-Arezzo, Ph.D., 1982, University of Rhode Island
Adjunct Assistant Professor Edward Drozda, M.B.A., 1989, Bryant College
Adjunct Assistant Professor Judith S. Heelan, Ph.D., 1982, University of Rhode Island
Adjunct Assistant Professor Margaret Kenney, M.S., 1983, University of Massachusetts, Dartmouth
Adjunct Assistant Professor Marjorie G. Kimball, M.S., 1981, Northeastern University
Adjunct Assistant Professor Leonard LaFazia, M.S., 1984, Salve Regina University
Adjunct Assistant Professor Anthony J. Lewandowski, M.S., 1985, University of Massachusetts, Dartmouth
Adjunct Assistant Professor Kenneth Mayer, M.D., 1977, Northeastern University
Adjunct Assistant Professor Frank Meglio, M.S., 1980, Northeastern University
Professor Emeritus Pei Wen Chang, Ph.D., 1965, Yale University

Specializations

Major specializations in clinical chemistry, clinical microbiology, hematology, immunohematology; minor specializations in adult education and management.

Master of Science

Admissions requirements: GRE recommended; bachelor's degree in medical technology, clinical laboratory science, microbiology, chemistry, or a related area; certification by a nationally recognized certifying agency, as a generalist or a specialist in clinical laboratory science, or a minimum of one year's postbaccalaureate clinical laboratory experience. One course in statistics is required. Applicants with deficiencies in background courses may be required to complete appropriate course work without graduate credit.

Program requirements: 33 credits including BCH 551, EDC 505 or 582, MTC 510, 512, 513, and six to nine credits in the area of specialization (ASP 534, MTC 502 and 543 for clinical chemistry; ASP 534, MTC 501, 541 for clinical microbiology; MTC 520, 521, and 530 for hematology and immunohematology). The remainder of courses are selected from education and management; also, a course from a technical area other than the declared area is recommended. Comprehensive written examination. Major research paper. The following courses are recommended for a minor specialization in health-care management: PHP 651, 652, and 680. These courses are recommended for a minor specialization in adult education: EDC 505, 529, 582, and 584.

MTC Courses
Medical Technology

401 Clinical Microbiology *(I, 8)*
402 Clinical Chemistry *(II, 8)*
403 Immunohematology *(I, 4)*
404 Hematology *(II, 6)*
405 Pathophysiology *(I, 2)*
406 Clinical Immunology *(II, 2)*
407 Clinical Microscopy *(I, 2)*
483 (or MIC 483) Introductory Diagnostic Microbiology *(I, 3)*

501 (or MIC 501) Advanced Clinical Microbiology I *(I or II, 3)* Current methodology employed in the processing of clinical microbiology specimens, isolation and identification of pathogenic microorganisms, and determination of antimicrobial susceptibility. *(Lec. 3) Pre: 401 or MIC 432 or equivalent.* Blazek-Arezzo and Stottmeier

502 Advanced Clinical Chemistry I *(I or II, 3)* The pathophysiologic mechanisms as they correlate to clinical chemistry data. Topics include mechanisms of pathology and analytical techniques. *(Lec. 3) Pre: 402 or equivalent.* Canick, Sheff, and Younkin

510 Clinical Laboratory Management *(I or II, 3)* Supervisory management principles applicable to the clinical laboratory. Includes the processes of supervision, decision making, job performance and evaluation, communications, organizational behavior, and labor relations in the modern laboratory. *(Lec. 3) Pre: 400-level medical technology internship or equivalent.* Coin and Williams

512 Special Problems in Clinical Laboratory Science *(I or II, 3)* Assigned research on an advanced level. Students required to outline problem, conduct the necessary research or experimental work, and present observations and conclusions in a written and oral report. *(Independent Study) Pre: 400-level medical technology internship or equivalent.* Staff

513 (or MIC 513) Advanced Clinical Immunology *(I or II, 3)* Theory, application, and techniques used in clinical immunology: immunochemistry, serology, immunohematology, immunopathology. *(Lec. 3) Pre: 406 or MIC 533 or equivalent.* LaFazia and Meglio

520 Advanced Hematology I *(I or II, 3)* Special problems, advanced techniques, and methodology in hematology; laboratory approach emphasized. *(Lec. 3) Pre: 404 or equivalent.* Barker

521 Advanced Hematology II *(I or II, 3)* Hematologic disorders: mechanisms, pathogenesis, diagnosis, and treatment; clinical approach emphasized. *(Lec. 3) Pre: 404 or equivalent.* Barker

530 Advanced Immunohematology *(I or II, 3)* Blood grouping and blood banking with emphasis on recent advances. Techniques used for identification of immune disorders, component preparation, tests to determine compatibility. *(Lec. 3) Pre: 403 or equivalent.* Kenney and Lewandowski

541 Advanced Clinical Microbiology II *(I or II, 3)* Current research and clinical methodology in clinical mycology, parasitology, mycobacteriology, epidemiology, and infectious disease serology. *(Lec. 3) Pre: 401 or MIC 432 or equivalent.* Blazek-Arezzo and Stottmeier

543 Advanced Clinical Chemistry II *(I, II, or SS, 3)* A comprehensive study of pathophysiologic mechanisms as they relate to clinical chemistry. Topics include immunochemistry, automation, enzymology, pharmacology, and endocrinology. *(Lec. 3) Pre: 402 or equivalent.* Canick, Sheff, and Younkin

551 Topics in Biochemistry for the Clinical Scientist
See Biochemistry 551.

590 Special Problems in Clinical Chemistry *(I, II, or SS, 1–6)* Intensive tutorial work, research, and readings in clinical chemistry. *(Independent Study) Pre: graduate standing and permission of chairperson.* Staff

591 Special Problems in Clinical Microbiology *(I, II, or SS, 1–6)* Intensive tutorial work, research, and readings in clinical microbiology. *(Independent Study) Pre: graduate standing and permission of chairperson.* Staff

592 Special Problems in Hematology *(I, II, or SS, 1–6)* Intensive tutorial work, research, and readings in hematology. *(Independent Study) Pre: graduate standing or permission of chairperson.* Staff

593 Special Problems in Immunohematology *(I, II, or SS, 1–6)* Intensive tutorial work, research, and readings in immunohematology: *(Independent Study) Pre: graduate standing and permission of chairperson.* Staff

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Community Planning and Area Development

M.C.P.
401-792-2248

Graduate Faculty

Chairperson: Professor Marcia Marker Feld, Ph.D., 1973, Harvard University
Director of Graduate Studies: Associate Professor Farhad Atash, Ph.D., 1985, Rutgers—The State University
Associate Professor Marshall M. Feldman, Ph.D., 1981, University of California
Associate Professor Howard H. Foster, Jr., Ph.D., 1970, Cornell University
Associate Professor Cynthia M. Hamilton, Ph.D., 1980, Boston University

Associate Professor Marjorie E. Jensen, M.S., 1978, University of Rhode Island
Adjunct Professor Carol J. Thomas, M.S., 1948, University of Connecticut
Adjunct Associate Professor Glenn R. Kumekawa, M.A., 1956, Brown University
Adjunct Associate Professor Robert Shaw, M.S.C.E., 1966, Purdue University
Adjunct Assistant Professor Elizabeth Burke Bryant, J.D., 1985, George Washington University
Adjunct Assistant Professor Mark Motte, M.C.P., 1986, University of Rhode Island
Adjunct Assistant Professor Mary Parella, M.C.P., 1989, University of Rhode Island
Adjunct Assistant Professor Daniel J. Schatz, J.D., 1978, University of Maine
Adjunct Assistant Professor David S. Winsor, M.C.P., 1980, University of Rhode Island

Specializations

The curriculum educates and trains planners for professional positions in community planning and development agencies in both the public and the private sectors. A core of study in theory and substantive methods relating to urban or urbanizing communities is required. In addition, four specializations are offered: environmental planning and land use, urban design and physical planning, housing and community development, and social policy planning.

The specialization in environmental planning and land use focuses both on planning of the built environment and on concern for the impact of development on the natural environment. The specialization in urban design and physical planning emphasizes the significant role urban (community) design plays in the overall planning process and the relation of that design to other functional areas in comprehensive planning; i.e., land use, transportation, and economic development. The specialization in housing and community development integrates economic, social, and political theories of development with methods and policies to improve living conditions in communities through housing and economic development. The social policy planning specialization emphasizes the elements of social structure and social characteristics that form the imperatives for policy in city planning.

Master of Community Planning

Admission requirements: GRE, undergraduate background in the social sciences, architecture, landscape architecture, natural resources, engineering, or geography preferred. Competency in statistical methods is required and may be demonstrated by having completed an acceptable course at the undergraduate or graduate level. This course does not count for graduate credit. Undergraduate courses in computer science and microeconomics are recommended but not required for admission to the program. The degree is accredited by the Planning Accreditation Board and is offered through the New England Regional Program.

Program requirements: The 54-credit program consists of 36 credits of required core courses, six credits of CPL 589 and 599, and 12 credits of courses in the specialization area. Students must select a specialization area by the end of their first semester of study, and must complete a four-course sequence in the area of specialization and a comprehensive examination covering the core and the area of specialization. CPL 510, 512, 522, 523, 526, 630, and 631 are required. CPL 501, 511, and 525 will also be required unless proficiency has been demonstrated by previous course work. A summer internship or equivalent experience is required. The following courses are required in the specialization areas. *Environmental Planning and Land Use:* CPL 545 and three courses from CPL 537, 538, 539, 549, REN 534, MAF 521, and NRS 410. *Urban Design and Physical Planning:* CPL 530 and three courses from CPL 516, 536, 538, 545, 546, 555, and CVE 442 and 446. *Housing and Community Development:* CPL 624 and three courses from CPL 540, 541, 542, 555, and 625. *Social Policy Planning:* CPL 624 and three courses from CPL 543, 625, LRS 546, ECN 404, and EDC 509. Other acceptable courses may be substituted for the electives where appropriate. Students normally take 12–15 credits per semester to complete degree requirements in two years.

CPL Courses
Community Planning

410 Fundamentals of Urban Planning *(II, 3)*

434 Introduction to Environmental Law *(II, 3)*

501 Introduction to Community Planning Practice *(I, 3)* The development of community planning in the U.S., history of governmental planning and evaluation of the planning profession, and the elements of planning practice. *(Lec. 3)* Foster

510 Community Planning and Political and Social Change *(II, 3)* Introduction to systems and central theories of determinants for social and planned change in urban and urbanizing communities. Focus on methodologies for political and social assessments. *(Sem. 3) Pre: 523 or permission of instructor.* Feld

511 Planning and Natural Environmental Systems *(I, 3)* Introduction to theories, methodologies, and substantive concerns of environmental resource analysis with attention given to coastal environmental issues. Focus on land, soils, watersheds, water quality, vegetation, air quality, wildlife, noise pollution. *(Lec. 3)* Staff

512 Spatial and Fiscal Relationships of Communities *(I, 3)* The structure and functions of human settlements. Classical and contemporary urban theory. How urbanization and planning influence each other. Emphasizes urbanization as a historical process tied to other social processes. *(Sem. 3)* Feldman

516 Seminar on the Urban Waterfront See Marine Affairs 516.

522 Planning Law *(I, 3)* General review and discussion of legal principles and thought concerned with property rights, political power, and the legal aspects pertinent to the planning and development of public and private activities. *(Lec. 3) Pre: second-year graduate standing or permission of instructor.* Schatz

523 Planning Theory *(I, 3)* Critical survey of planning theories and contemporary planning concepts. Values, assumptions, and processes of various planning paradigms as related to decisions in community planning. Specific emphasis on values and ethics in planning theory. *(Sem. 3)* Feld

525 Introduction to Planning Methods *(I, 3)* Introduction to basic quantitative methods in community planning. Emphasis on analysis of demographic, economic, housing, and other basic planning data. Introduction to computer applications in planning. *(Lec. 3, Lab. 1.5) Pre: STA 308 or permission of instructor.* Feldman

526 Planning and Policy Analysis *(II, 3)* Social research methods for planning, with emphasis on master's thesis and applied research projects. Philosophy of science, research design, proposals, surveys, sampling, and data analysis for planning. *(Lec. 3, Lab. 1.5) Pre: 525 and one course in statistics.* Feldman

530 Urban Design and Public Policy *(II, 3)* Significant concepts of historical and contemporary urban form ranging from entire cities to architectural details. Emphasis on urban design methods, process, and elements. Alternatives for implementation of urban design projects. *(Lec. 3)* Atash

536 International Comparisons in Urban and Regional Planning *(I, 3)* Urban and regional development issues and policies in advanced and developing countries. Emphasis on population growth, urbanization, and spatial development. *(Sem. 3) In alternate years.* Atash

537 (or REN 532) Land Resources Economics *(I, 3)* The study of economic relationships of man and scarce natural and man-made resources. Supply and demand, rent theory, resources conservation, and the impact of public policy and law. *(Lec. 3)* Wichelns

538 Site Planning *(II, 3)* Site analysis and planning, including street design, principles of house grouping, and residential subdivision layout. Site planning standards for office development and shopping centers. *(Lec. 3)* Atash

539 Environmental Law *(II, 3)* Analysis of specific environmental issues and policies including facility siting, land use and constitutional issues, comprehensive planning, public trust doctrine, concurrence and state impact assessments. Independent research and presentation required. *(Lec. 3)* Schatz

540 Community-Based Housing *(I, 3)* Analysis of local housing needs, issues and perspectives in the context of federal and nonfederal program activities. Review of public-purpose strategies to provide housing that meets community needs. *(Sem. 3) Pre: graduate standing or permission of instructor.* Jensen

541 Urban and Rural Housing Policy *(II, 3)* Assessment of urban and rural housing needs; relationship of housing to national economic policy; housing finance; production and cost characteristics; tax policy, filtering and neighborhood change; and housing policy assessments. *(Sem. 3) Pre: 410 or 501 or permission of instructor. In alternate years.* Feldman

542 Housing and Community Development Law *(II, 3)* Examination of housing and community development laws through cases and readings. Focuses on the laws and programs that have been developed to address the problem of providing affordable housing in the United States. *(Sem. 3) Pre: graduate standing or permission of instructor.* Bryant

543 Methods of Social Policy Analysis *(II, 3)* Methods and techniques of social public policy analysis as applied to social problems and the evaluation of policy options, programs, and quality of life. *(Sem. 3) Pre: 624 or permission of instructor. In alternate years.* Feld

545 Land Development Seminar *(II, 3)* A study of land management techniques including zoning, subdivision regulation, and land suitability and analysis; their use, and environmental implications in land and water development. *(Sem. 3) Pre: 511 or permission of instructor.* Staff

546 (or CVE 546) Urban and Rural Transportation *(I, 3)* Issues confronting planning for urban and rural transportation systems; the variety of policies that governments pursue in addressing issues and problems; technical and political constraints, transportation studies, and demand analysis techniques. *(Lec. 3) Pre: 410 or 501 or permission of instructor. In alternate years.* Shaw and Lee

549 Seminar in Ecological Planning *(I, 3)* Advanced seminar in ecological planning. Topics include hazardous waste, power plant siting, major transportation facilities, solid waste, aquifer protection, among others. Particular emphasis on wetlands and marine and coastal settings. *(Sem. 3) Pre: 511 or permission of instructor.* Staff

555 Introduction to Economic Development Planning *(II, 3)* Overview of economic development planning theory and practice. Emphasis on state and local planning in industrialized countries. The planning process and analytical techniques. Business, human resource, and community development strategies. *(Sem. 3) Pre: 512 or permission of instructor. In alternate years.* Feldman

589 Master's Project Research *(I and/or II, 1–6)* A substantial, self-directed planning project, by one or several students, under guidance of a major professor. Number of credits to be determined each semester. *S/U credit.* Staff

591, 592 Special Problems in Planning *(I or II, 1–6 each)* Individual investigation of special problems in planning. *(Independent Study)* Staff

593, 594, 595, 596, 597, 598 Special Problems in Planning *(I or II, 1–6 each)* Group investigation of special problems in planning. *(Independent Study)* Staff

599 Master's Thesis Research *(I or II, 1–6)* Number of credits is determined each semester in consultation with the major professor or program committee. *S/U credit.* Staff

624 Planning Policy and Management in Urban Areas *(II, 3)* City planning as applied to urban policy in cities and metropolitan areas. Includes social, economic, and physical planning in the context of community development programs and management processes. *(Sem. 3) Pre: 501, 511, 525, or permission of instructor.* Foster

625 Central City Revitalization and Implementation *(I, 3)* Advanced concentration course in central city planning. Focus on the problems of central cities and the causes of these problems. Emphasis on government policies to deal with the problems of the inner city. *(Sem. 3) Pre: 624 or permission of instructor.* Foster

630 Comprehensive Planning Studio *(II, 6)* Applied team problem solving. Planning experience working with specific client and/or community emphasizing sequential process and group product. Project to include problem definition, conceptual design analysis, and oral/graphic presentations. *(Studio 6) Pre: 501, 511, 523, 525, or permission of instructor.* Foster

631 Advanced Planning Studio *(I, 6)* Team projects in planning and design; research and program development; field studies and problem analysis in local and state contexts. Development and evaluation of alternative solutions. *(Studio 6) Pre: 630 or permission of instructor.* Atash

691, 692 Special Problems in Planning *(I or II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study)* Staff

693, 694 Special Problems *(I or II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the requirements of a group of students. *(Independent Study)* Staff

Comparative Literature Studies

M.A.
401-792-5911

Graduate Faculty

Coordinator: Professor John R. Leo, Ph.D., 1972, Northwestern University

Department of English
Professor Lois Cuddy, Ph.D., 1975, Brown University
Professor Wilfred P. Dvorak, Ph.D., 1972, Indiana University
Professor Daniel D. Pearlman, Ph.D., 1968, Columbia University
Professor Ralph M. Tutt, Ph.D., 1966, Duke University
Assistant Professor Jean Walton, Ph.D., 1988, State University of New York, Buffalo

Department of Languages
(French) Associate Professor Ira A. Kuhn, Ph.D., 1970, University of Kansas
(French—Linguistics) Professor Kenneth H. Rogers, Ph.D., 1970, Columbia University
(Italian) Professor Paschal Viglionese, Ph.D., 1969, Rutgers—The State University
(Italian) Associate Professor Wallace P. Sillanpoa, Ph.D., 1980, University of Connecticut
(Portuguese) Professor Gregory R. McNab, Jr., Ph.D., 1973, New York University
(Russian) Professor Sona Aronian, Ph.D., 1971, Yale University
(Spanish) Professor Robert Manteiga, Ph.D., 1977, University of Virginia
(Spanish) Associate Professor Thomas D. Morin, Ph.D., 1975, Columbia University
(Spanish) Associate Professor Mario Trubiano, Ph.D., 1979, University of Massachusetts

Specializations

English language literatures (American, British, Irish, Scots), Classical, French (including Quebecois and Black French literature), German, Italian, Portuguese, Russian, and Hispanic literatures.

Master of Arts

Admission requirements: B.A. degree; formal training or demonstrable competence in literature; high level of proficiency in one foreign language.

Program requirements: first literature, nine credits; second literature, six credits (one of the literatures may be English); CLS 510; electives pertinent to a student's program of study to be approved by the major professor and advisory committee; reading knowledge of a second foreign language; comprehensive examination; thesis option—thesis and 24 credits; nonthesis option—30 credits, including six credits of independent study resulting in the production of extended essays.

CLS Courses
Comparative Literature Studies

450 Studies in Comparative Literature *(I or II, 3)*

510 Introduction to Comparative Literature *(I or II, 3)* Theoretical and practical concerns of comparative literature: its nature and scope, methods, bibliography, and special problems. *(Seminar) Pre: graduate standing or permission of chairperson.* Viglionese

520 Literary Theory and Criticism *(I or II, 3)* Metacriticism: literary criticism as theory and practice and the relationship between literary and critical discourse. *(Seminar) Pre: graduate standing or permission of chairperson. May be repeated once with change of topic.* Staff

530 Approaches in Comparative Literature *(I or II, 3)* Study of theme/myth, movement/ era, genre/forms in two or more literatures, or interrelations with other disciplines. *(Seminar) Pre: graduate standing or permission of chairperson. May be repeated once with change of topic.* Staff

597 Special Problems *(I and II, 1–6)* Group and/or individual investigation of special problems in comparative literature studies. *(Independent Study)* Staff

599 Master's Thesis Research *(I and II, 1–6)* Number of credits is determined each semester in consultation with the major professor and the Comparative Literature Studies Advisory Committee. *(Independent Study)* Staff

See other listings under English and Modern and Classical Languages and Literatures.

Computer Science

M.S.
401-792-2701

Graduate Faculty

Chairperson: Professor Edmund A. Lamagna, Ph.D., 1975, Brown University
Director of Graduate Studies: Professor Gerard M. Baudet, Ph.D., 1978, Carnegie Mellon University
Professor Edward J. Carney, Ph.D., 1967, Iowa State University
Associate Professor Frank M. Carrano, Ph.D., 1969, Syracuse University
Associate Professor James G. Kowalski, Ph.D., 1975, University of Notre Dame
Associate Professor Bala Ravikumar, Ph.D., 1987, University of Minnesota
Assistant Professor Joan Peckham, Ph.D., 1990, University of Connecticut
Assistant Professor Victor Wolfe, Ph.D., 1991, University of Pennsylvania
Adjunct Associate Professor Charles R. Arnold, Ph.D., 1976, Harvard University
Adjunct Associate Professor Charles M. Strauss, Ph.D., 1967, Brown University
Adjunct Assistant Professor Robert A. Ravenscroft, Jr., Ph.D., 1991, Brown University
Adjunct Assistant Professor Robert V. Rubin, Ph.D., 1988, Brown University

Specializations

Analysis of algorithms, artificial intelligence, computer architecture, programming languages, theory of computation, databases, operating systems, distributed computing, expert systems, graphical user interfaces, software engineering, symbolic and algebraic computation, VLSI systems, numerical analysis, statistical computation, simulation, computer-aided education.

Master of Science

Admission requirements: bachelor's degree, including undergraduate training in computer science at least through the syntax and semantics of a variety of programming language types, machine and assembly language concepts, fundamentals of data structures and algorithms. Mathematics through linear algebra, calculus of several variables, and discrete mathematics. GRE, including advanced test in computer science. Applicants may submit, if they so desire, additional advanced GRE scores for consideration.

Program requirements for thesis option: 1) a minimum of 24 credits (exclusive of thesis) and a thesis; 2) at least 15 credits must be earned at the 500 level or above; 3) at least 18 credits must be from computer science courses; 4) completion of at least six credits in one of the following areas and three credits in each of the other two: architecture and systems—CSC 511, 512, 517; mathematical foundations—CSC 541, 542, 544; programming languages—CSC 501, 502.

Program requirements for nonthesis option: 1) a minimum of 30 credits, including at least one course with a substantial paper involving significant independent research; 2) at least 21 credits must be earned at the 500 level or above; 3) at least 24 credits must be from computer courses; 4) completion of at least six credits in each of two of the following areas and three credits in the third: architecture and systems—CSC 511, 512, 517; mathematical foundations—CSC 541, 542, 544; programming languages—CSC 501, 502; 5) passing a written comprehensive examination.

Doctor of Philosophy

See Applied Mathematical Sciences on page 30.

CSC Courses
Computer Science

402 Compiler Design *(I, 3)*
406 Computer Graphics *(II, 3)*
411 Computer Organization *(I, 3)*
412 Operating Systems *(II, 3)*
420 Software Engineering *(II, 3)*
436 Database Management Systems *(I, 3)*
440 Design and Analysis of Algorithms I *(I, 3)*
445 Formal Languages and Automata Theory *(II, 3)*
447 (or MTH 447) Discrete Mathematical Structures *(I, 3)*
450 Fundamentals of Numerical Computation *(II, 3)*
481 Artificial Intelligence *(II, 3)*
491 Directed Study in Computer Science *(I and II, 1–3)*
492 Special Topics in Computer Science *(I or II, 3)*

501 Programming Language Semantics *(I, 3)* Design, analysis, implementation, and comparative study of major programming language families. Topics include procedural and block-structured languages, interpretive languages, concurrency, functional languages, object-oriented programming, logic programming, dataflow languages and machines. *(Lec. 3) Pre: 301 and 311.* Staff

502 Theory of Compilers *(II, 3)* An advanced course in compiler construction covering advanced parsing techniques, compiler-writing tools, type checking and type inference, code optimization, and compiling nonstandard language features. *(Lec. 3) Pre: 402. In alternate years. Next offered spring 1995.* Staff

511 Advanced Computer Organization *(I, 3)* Evaluation of high-performance computer systems with respect to architectures, operating systems, and algorithms. High-speed conventional machines; array processors; multiprocessors; data flow machines; RISC architectures; VLSI-based machines. *(Lec. 3) Pre: 411. In alternate years. Next offered fall 1995.* Staff

512 Topics in Operating Systems *(II, 3)* In-depth studies of topics chosen from the following list: concurrent programming, computer systems performance, and distributed systems. *(Lec. 3) Pre: 412. In alternate years. Next offered spring 1996.* Staff

517 Design and Analysis of VLSI Systems *(I, 3)* Illustration and analysis of VLSI algorithms and architecture. Emphasis on design of very large-scale integrated circuits, related methodologies, and theoretical foundations. VLSI technologies, fabrication, automated design tools for various problems. *(Lec. 3) Pre: 411 and either 340 or 447. In alternate years. Next offered fall 1994.* Staff

525 (or IME 525) Simulation *(II, 3)* Discrete simulation models. Comparison of discrete change simulation languages. Methodology including generation of random variates, design of simulation experiments for optimization and validation of models and results. Selected applications. *(Lec. 3) Pre: 212 and 6 credits of statistics.* Staff

541 Design and Analysis of Algorithms II *(I, 3)* Advanced topics in the design and analysis of algorithms including combinatorial optimization and graph algorithms; computational geometry; primality and factoring, public-key cryptography; minimal comparison sorting; size and delay in switching circuits. *(Lec. 3) Pre: 440. In alternate years. Next offered fall 1995.* Staff

542 Mathematical Analysis of Algorithms *(I, 3)* Mathematical techniques for the analysis of algorithms. Sums and products; finite difference calculus; properties of binomial coefficients; Stirling, harmonic, and Fibonacci numbers; recurrence relations; generating functions; asymptotic approximation. Case studies. *(Lec. 3) Pre: 440. In alternate years. Next offered fall 1994.* Staff

544 Theory of Computation *(II, 3)* Automata and formal languages; undecidability; time and space complexity classes and relations between them; hierarchy and gap theorems; Savitch's theorem; alternating Turing machines; the complexity class NC. *(Lec. 3) Pre: 340 or 447. In alternate years. Next offered spring 1996.* Staff

547 Combinatorics and Graph Theory
See Mathematics 547.

548 Topics in Combinatorics
See Mathematics 548.

550 Advanced Numerical Computation *(II, 3)* Design of efficient numerical algorithms under various models of computation. Topics include polynomial and integer computations, computational linear algebra with applications to combinatorial optimization, lower bounds. *(Lec. 3) Pre: 450. In alternate years. Next offered spring 1995.* Staff

581 (or ELE 581) Special Topics in Artificial Intelligence *(II, 3)* Topics of specialized or current interest, which may change. Topics may include expert systems, natural language processing, neural network models, machine learning. AI applications in remote sensing. *(Lec. 3) Pre: 481 or permission of instructor. May be repeated with permission. In alternate years. Next offered spring 1996.* Staff

583 Computer Vision
See Electrical Engineering 583.

591 Directed Study in Computer Science *(I and II, 1–3)* Advanced work in computer science conducted as supervised individual projects. *(Independent Study) Pre: permission of chairperson. S/U credit.* Staff

592 Special Topics in Computer Science *(I or II, 3)* Advanced topics of current interest in computer science. *(Lec. 3) Pre: permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Economics

See Resource Economics on page 102.

Economics—Marine Resources

(Interdepartmental)

See Resource Economics on page 102.

Education

M.A., Ph.D.
401-792-2564

Graduate Faculty

Chairperson: Professor Theodore Kellogg, Ph.D., 1971, Florida State University
Director of Graduate Studies: Professor Robert W. MacMillan, Ph.D., 1966, University of Texas, Austin

Adult Education
Professor William Croasdale, Ed.D., 1966, Teachers College, Columbia University
Professor Theodore Kellogg, Ph.D., 1971, Florida State University
Professor Robert W. MacMillan, Ph.D., 1966, University of Texas, Austin
Associate Professor John Boulmetis, Ph.D., 1982, Ohio State University
Associate Professor Richard G. Nelson, Ph.D., 1972, University of Wisconsin

Educational Research
Professor John V. Long, Jr., Ph.D., 1971, Syracuse University
Professor Richard F. Purnell, Ph.D., 1966, University of Texas

Elementary Education
Associate Professor Richard E. Sullivan, Ph.D., 1971, University of Texas, Austin
Associate Professor Susan L. Trostle, Ed.D., 1984, Pennsylvania State University
Assistant Professor Sandy J. Hicks, Ph.D., 1993, University of Arizona
Assistant Professor Alora Valdez, Ph.D., 1992, University of Arizona
Assistant Professor Betty Young, Ph.D., 1988, University of California, Los Angeles

Reading Education
Associate Professor Susan L. Trostle, Ed.D., 1984, Pennsylvania State University
Assistant Professor James F. Barton, Ph.D., 1990, Stanford University
Professor Emeritus Marguerite Bumpus, Ed.D., 1969, University of Massachusetts

Science Education
Professor William Croasdale, Ed.D., 1966, Teachers College, Columbia University
Professor Theodore M. Kellogg, Ph.D., 1971, Florida State University

Secondary Education
Professor Barbara Brittingham, Ph.D., 1973, Iowa State University
Professor William Croasdale, Ed.D., 1966, Teachers College, Columbia University
Professor John V. Long, Jr., Ph.D., 1971, Syracuse University
Professor William L. McKinney, Ph.D., 1973, University of Chicago
Professor Francis X. Russo, Ph.D., 1964, Boston University
Professor George H. Willis, Ph.D., 1971, The Johns Hopkins University
Associate Professor David M. Byrd, Ph.D., 1980, Syracuse University
Associate Professor Richard G. Nelson, Ph.D., 1972, University of Wisconsin

Enrollment of foreign students is limited; minimum TOEFL score of 600 is required.

The Master of Arts degree is offered in the following areas of study. Applicants should specify the area of specialization on the application form.

Adult Education

Admission requirements: MAT or GRE, a baccalaureate degree from an accredited institution, and an interview with program faculty.

Program requirements: thesis or nonthesis option. Thirty-three credits, including 12 credits of core courses (EDC 505, 529, 583 and 584), 15 credits of electives structured into either a predefined subspecialization area or a unique subspecialization area designed in conjunction with the student's advisor. Predefined subspecializations include administration, adult literacy, Education, Training, and Management (ETMS), gerontology, training and development, and vocational-technical and extension education. The Education, Training, and Management (ETMS) subspecialization is designed for U.S. naval officers who wish to obtain the ETMS "P" code designation. Thesis or nonthesis seminar. Nonthesis option requires a written comprehensive examination, and at least one course with a substantial paper requiring significant independent research.

Educational Research

Admission requirements: MAT or GRE, instructional experience, strong background in mathematics or statistics.

Program requirements: thesis; 33 credits, including EDC 503, 529, 574, PSY 434, 520, one computer science and two experimental statistics electives.

Elementary Education

Admission requirements: MAT or GRE and teaching certificate, one year teaching experience or equivalent desirable.

Program requirements: thesis or nonthesis option. EDC 529, 21–24 credits including three credits of foundations, three credits of methods, three credits of free electives, six credits of thesis or nonthesis seminar, and three to six credits taken outside the Department of Education. Nonthesis option requires a written comprehensive examination, and at least one course with a substantial paper requiring significant independent research.

Reading Education

Admission requirements: MAT or GRE and teaching certificate, one year teaching experience or equivalent desirable.

Program requirements: thesis or nonthesis option. EDC 503, 529; 24 credit hours of courses approved for the preparation of reading specialists, including a thesis or six credit hours of clinic or practicum experience, and one or more electives. Nonthesis option requires a written comprehensive examination, and at least one course with a substantial paper requiring significant independent research.

Science Education

Admission requirements: MAT or GRE and teaching certificate, undergraduate major in science, interview with faculty.

Program requirements: 30 credits, including EDC 529; 12–18 credits of education electives, including six credits of thesis or nonthesis seminar and a minimum of 12 credits in science. Nonthesis option requires a written comprehensive examination, and at least one course with a substantial paper requiring significant independent research.

Secondary Education

Admission requirements: MAT or GRE and teaching certificate, one year's teaching experience desirable, undergraduate major in academic area of secondary education, interview with faculty.

Program requirements: thesis or nonthesis option. Thirty credits, including EDC 529; three credits of foundations; 6–12 credits of education, including six credits for thesis or nonthesis seminar and a minimum of 12 credits in the academic area. Nonthesis option requires a written comprehensive examination, and at least one course with a substantial paper requiring significant independent research.

For Teacher Certification, see page 107.

Ph.D. in Education

The Ph.D. in education is a new program, and is offered jointly by the University of Rhode Island and Rhode Island College. Students are admitted on a cohort model, with the first class matriculating in September 1995.

This doctoral program is designed to prepare scholar-practitioners for professional roles as educational leaders, mentors, and scholars. Students will be expected to acquire and apply the skills of professional collaboration in the profession, develop and employ the skills and processes of scholarly inquiry, demonstrate expertise in an area of specialization that advances the mission of the American school, and establish practices that promote progress in school settings through attention to emerging research and development.

For information about this program, and to obtain appropriate application materials, contact the Graduate School, University of Rhode Island, 204 Quinn Hall, Kingston, RI 02881. The deadline for receipt of completed applications is February 1, 1995.

EDC Courses
Education

401 Development and Utilization of Instructional Materials *(I and II, 3)*
402 The Education of Special Needs Students *(I and II, 3)*
403 History of Education *(I, 3)*
407 Philosophy of Education *(I and II, 3)*
410 Seminar and Supervised Field Practicum in Education of the Aging *(I and II, 3)*
424 Teaching of Reading *(I and II, 3)*
425 The Use of Trade Books in the Reading Program *(I, 3)*
435 (or WRT 435) The Teaching of Composition *(I and II, 3)*
448 Reading in the Content Areas *(I, 3)*
449 Teaching Adolescent Literature *(I, 3)*
478, 479 Problems in Education *(I and II, 0–3 each)*

500 Foundations of Adult Education *(I and II, 3)* Examination of fundamental structure, functions, problems, and history of adult education in America. Focus on socioeconomic factors and philosophical commitments that have shaped various programs. *(Lec. 3) Pre: graduate or senior standing and permission of instructor.* Russo and Boulmetis

502 The Modern Curriculum Movement *(I, 3)* Development of recent thinking of American curriculumists. The nature of curriculum development analyzed through the traditionalist, social scientific, and reconceptualist schools of thought. *(Lec. 3)* Willis

503 Education in Contemporary Society *(II, 3)* Leading educators' responses to issues and challenges confronting American education. Emphasis on identification and analysis of contemporary theories and practices reflecting the relationship between characteristics of society and educational values. *(Lec. 3)* Russo and Willis

504 Adult Basic Education *(I and II, 3)* Teaching of adults whose educational level is below high school completion. Physical, social, and psychological characteristics of disadvantaged adults and various techniques and materials useful in motivating and teaching them. *(Lec. 3) Pre: permission of instructor.* Staff

505 Leadership Development in Adult Programs *(I or II, 3)* Discussion of leadership concepts, styles, and implications. Discussion and practice in the use of several adult education methods and techniques for increasing the effectiveness of groups and organizations. *(Lec. 3) Pre: permission of instructor.* Staff

506 Foundations of Education: Teaching and Learning *(SS, 7)* Philosophical, cultural, and psychological foundations of American education. Focus on ideological beliefs, cultural factors, and psychological principles and practices that shape teaching and learning. Field work integrated with classroom assignments. *Pre: permission of chairperson.* Russo or Sullivan

508 Interdisciplinary Curriculum Development *(I, II, or SS, 3)* Curriculum development of interdisciplinary units for elementary and middle schools. Focus is on grade-level units which incorporate multiple subject areas. Both individual and group projects required. *(Lec. 3) Pre: teacher certification.* Staff

514 Current Trends in Elementary Education *(I, 3)* For teachers and administrators, the most effective use of instructional materials, media of communication, and personnel in elementary school. *(Lec. 3) Pre: 529 or permission of chairperson. In alternate years. Next offered 1995–96.* Staff

515 Discipline and Youth in Schools *(I or II, 3)* Seminar for teachers interested in classroom principles and techniques from research on discipline in public secondary schools. Will include dramatic role-playing by participants when feasible. *(Lec. 3) Pre: teacher certification or permission of instructor.* Purnell

516 Teaching English as a Second Language to Adults *(II, 3)* Methods and materials for educators who teach English as a second language to adults. *(Lec. 3) Pre: permission of instructor.* Staff

517 Teaching Social Studies in the Elementary School *(I, II, or SS, 3)* Intensive research in various cross-subject topics within the social studies. Systematic analyses of learning theories and methods as they relate to the teaching of social studies in the elementary grades. *(Lec. 3) Pre: graduate or postgraduate standing.* MacMillan

518 Teaching Science in the Elementary School *(I or II, 3)* Emphasis on the development, preparation, use, and evaluation of materials appropriate for the elementary classroom from biology, zoology, chemistry, physics, geology, astronomy, electricity, meteorology, and oceanography. *(Lec. 3) Pre: 12 credits in science.* Staff

520 Teaching of Arithmetic *(I, 3)* For the experienced teacher, examination of the principles underlying teaching of arithmetic in the elementary school, comprehensive survey of materials and methods available for the classroom teacher of arithmetic. *(Lec. 3) Pre: senior or graduate standing. In alternate years. Next offered 1994-95.* Staff

521 Teaching Basic Reading to Adults *(I or II, 3)* Techniques for teaching basic reading skills to illiterate adults; diagnosis, methods, and materials. *(Lec. 3) Pre: 504 or permission of instructor.* Staff

522 Microcomputer Applications in the Classroom *(I and II, 3)* Introduction to the use of microcomputers in elementary and secondary classrooms. History, current use, techniques for evaluating hardware and software, implementation issues, future developments. *(Lec. 3) Pre: senior or graduate standing.* Staff

528 Teaching Language Arts *(II, 3)* For the elementary school classroom teacher. Preparation, presentation, use, and evaluation of methods and materials for teaching the communications skills (emphasis on listening, speaking, and writing). *(Lec. 3) Pre: senior or graduate standing. In alternate years. Next offered 1994-95.* Staff

529 Foundations of Educational Research *(I and II, 3)* Analysis of the current major research approaches to educational problems with emphasis on interpreting published research involving the language of statistics. Functional skills in basic descriptive statistics needed prior to enrolling. *(Lec. 3)* Purnell

530 Qualitative Research and Evaluation *(I or II, 3)* Qualitative methods, including ethnography, for obtaining and using data in describing, interpreting, and reaching warranted judgments, particularly about educational and social problems. Emphasis on developing individual projects and writing formal reports. *(Lec. 3) Pre: permission of instructor.* Willis

534 Mathematics in the Secondary School *(II, 3)* Implementation of a modern mathematics program in the secondary school through a study of modern mathematics concepts, experimental programs, and instructional planning. *(Lec. 3) Pre: 15 credits in mathematics.* Croasdale

535 Classroom Observation and Evaluation *(I or II, 3)* Practicum in informal, naturalistic methods of observing and evaluating classrooms. Designed to increase teachers' and administrators' understanding of their own and others' classrooms in fostering individual and staff professional development. *(Lec. 2, Lab. 2) Pre: teaching experience, eligibility for teacher certification, or permission of instructor.* Willis

538 Teaching the Gifted and Talented *(I or II, 3)* Social, psychological, legal, and educational issues related to identification, selection, and instruction of gifted and talented students. *(Lec. 3) Pre: one undergraduate general psychology course, graduate standing, or permission of instructor.* Sullivan

539 Evaluation and Monitoring of Occupational Training Programs *(I or II, 3)* Evaluation and monitoring theory and practice for occupational training programs. Focus on development of systems for job training such as CETA, Vocational Education, and private sector programs. *(Lec. 3) Pre: 529 or permission of instructor.* Boulmetis

540 Learning Disabilities: Assessment and Intervention
See Psychology 540.

563 Teaching Reading to Multicultural Populations *(I, 3)* Identification of the strengths of learners whose cultural and socioeconomic backgrounds vary, and the implications for teaching reading. Special emphasis on the selection and development of appropriate materials and teaching strategies. *(Lec. 3) Pre: 424 or permission of instructor.* Staff

564 Reading Diagnosis and Intervention *(SS, 4)* Emphasizes traditional and alternative methods for diagnosing readers' weaknesses and strengths. Focuses on matching the diagnosed needs of the individual reader with appropriate instructional intervention strategies. *(Lec. 4) Pre: acceptance into the master's program in reading education.* Hoyt or Barton

565 Analysis and Evaluation of Current Research in Reading *(I, 3)* In-depth review of reading research on selected topics. Analysis of findings in historical perspective. Implications for reading teachers and reading programs. *(Sem. 3) Pre: 424 or permission of instructor. In alternate years. Next offered 1995–96.* Staff

566, 567 Practicum in Reading *(I and II, 3 each)* Supervised case studies, practicum, and seminar reports on an individual reading project at either the elementary or secondary level. (120 hours plus seminar) *(Practicum) Pre: 562 and permission of instructor.* Staff

569 Middle School Curriculum *(SS, 3)* Current middle school curriculum organization and materials with emphasis on the flexibility and integration of various content areas. *(Lec. 3) Pre: graduate standing.* Staff

570 Elementary School Curriculum *(II, 3)* Modern curriculum in the elementary school with emphasis on the needs of children. Covers language arts, social studies, science, arithmetic, and special subjects. *(Lec. 3) Pre: 503, 529 or equivalent. In alternate years. Next offered 1995–96.* Staff

574 Current Trends in Secondary Education *(I and II, 3)* Effective use of instructional materials, media of communication, and organization of personnel and current research. *(Lec. 3) Pre: 529, 571 or permission of chairperson.* Staff

575 Supervised Field Study/Practicum and Seminar in Education *(I and II, 3)* For nonthesis candidates. Lectures, seminars, and field work. Candidates plan and conduct a field study/practicum project approved by the instructor and the student's professor. A formal proposal is developed, submitted, and approved, the project completed, and a formal paper defended. *(Practicum) Pre: admission to a master's program in education and permission of instructor. May be repeated for a maximum of 6 credits.* Staff

577 Organization and Administration in Elementary School *(I, 3)* Functions and duties of elementary school principals. *(Lec. 3) In alternate years. Next offered 1995–96.* Staff

579 Labor Relations and Collective Bargaining in Education
See Labor Studies 579.

581 Administering Adult Programs *(I or II, 3)* Administration, personnel management, resource management, recruitment, staff development, and supervision within programs dealing with adults as learners. *(Lec. 3) Pre: 505 or permission of instructor.* Staff

582 Instructional Systems Development for Adult Programs *(I, 3)* Designing and implementing instructional systems. Discussion of the basic tenets underlying theories of instructional technology, curriculum development, and curriculum change as they apply to adult learners in a variety of settings. *(Lec. 3) Pre: 580 or 581 or permission of instructor.* Staff

583 Planning, Design, and Development of Adult Learning Systems *(I, 3)* Overview of the program planning process including goal setting, needs analysis, program planning, and implementing change strategies. Discussion of effective functioning in the role of change agent within an organization. *(Lec. 3) Pre: permission of instructor.* Staff

584 The Adult and the Learning Process *(I and II, 3)* Examination of the adult as a learner with emphasis on the factors that affect adult learning and learning processes related to instruction. *(Lec. 3) Pre: 581 or permission of instructor.* Staff

586, 587 Problems in Education *(I and II, 0–3 each)* Advanced work for graduate students in education. Courses conducted as seminars or as supervised individual projects. *(Independent Study) Pre: permission of chairperson. May be repeated for credit with different topic.* Staff

593 Teaching Social Studies in the Secondary School *(I, II, or SS, 3)* Research and examination of the structure, functions, and problems of teaching social studies in the secondary school. Emphasis on researching current social problems as they relate to their historical antecedents. *(Lec. 3) Pre: teacher certification or permission of instructor.* MacMillan

594 Organization and Supervision of Reading Programs *(II, 3)* Various roles of the reading specialist in relation to the other line-staff personnel. Problems concerning the orientation of new teachers, reading research and development, in-service programs, and community support. *(Lec. 3) Pre: 562. In alternate years. Next offered 1995–96.* Staff

596 Organization Development in Education
See Human Development and Family Studies 562.

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

920 Workshop for Teachers *(I and II, 1–3)* Current issues in education. Specific topics offered for inservice teachers and administrators. May be repeated with different topic. *(Workshop) Pre: teacher certification.* Staff

ADE Courses
Adult and Extension Education

488 Methods and Materials for Adult Extension Education *(I and II, 3)*
491, 492 Special Problems in Adult Education *(I and II, 1–3 each)*

Electrical Engineering

M.S., Ph.D.
401-792-2505

Graduate Faculty

Chairperson: Professor William Ohley, Ph.D., 1976, State University of New York, Stony Brook
Director of Graduate Studies: Associate Professor Peter F. Swaszek, Ph.D., 1982, Princeton University
Professor G. Faye Boudreaux-Bartels, Ph.D., 1983, Rice University
Professor James C. Daly, Ph.D., 1967, Rensselaer Polytechnic Institute
Professor Leland B. Jackson, Sc.D., 1970, Stevens Institute of Technology
Professor Steven M. Kay, Ph.D., 1980, Georgia Institute of Technology
Professor Ramdas Kumaresan, Ph.D., 1982, University of Rhode Island
Professor Gabriel Lengyel, Ph.D., 1964, University of Toronto
Professor Allen G. Lindgren, Ph.D., 1963, University of Connecticut
Professor Shmuel Mardix, Ph.D., 1969, University of Jerusalem
Professor Shashanka S. Mitra, Ph.D., 1957, University of Michigan
Professor Angaraih G. Sadasiv, Ph.D., 1963, Purdue University
Professor John E. Spence, Ph.D., 1962, University of Wisconsin
Professor Harish R.B. Sunak, Ph.D., 1974, University of Southampton
Professor Donald W. Tufts, Sc.D., 1960, Massachusetts Institute of Technology
Professor Richard J. Vaccaro, Ph.D., 1983, Princeton University
Associate Professor Godi Fischer, Ph.D., 1985, Swiss Federal Institute of Technology in the Institute of Telecommunications
Associate Professor Jien-Chung Lo, Ph.D., 1989, University of Southwestern Louisiana
Associate Professor Ying Sun, Ph.D., 1985, Worcester Polytechnic Institute
Associate Professor Qing Yang, Ph.D., 1988, University of Southwestern Louisiana
Adjunct Professor Pranab K. Banerjee, Ph.D., 1971, University of Rhode Island
Adjunct Assistant Professor David O. Williams, M.D., 1969, Hahnemann Medical College
Professor Emeritus Charles Polk, Ph.D., 1956, University of Pennsylvania

Specializations

Acoustics and underwater acoustics: information processing in acoustic channels, speech processing, modeling of electro-acoustical devices.

Biomedical engineering: physiologic systems modeling and control; medical instrumentation employing digital computer techniques, pattern recognition and image processing in medicine (texture analysis, image classification, and segmentation); biological effects of electric and magnetic fields at the cellular level.

Computer engineering and VLSI: microprogramming systems, multiprocessing, high-speed signal processing; processor realization using VLSI; MOS layout and microchip design; data structures and computer architectures, fault-tolerant computing.

Communication theory: statistical and computer communications; vector quantization; noise modeling and detection; data compression and coding; local area networks, reliable and secure communication.

Digital signal processing: detection and parameter estimation; prediction and filtering; spectrum analysis; array processing; digital filter synthesis; adaptive filtering, algorithm design.

Electrical and optical properties of materials: optical properties of nonmetallic solids, laser-matter interaction, photocathodes; crystallographic techniques for submicron X-ray lithography; radiation damage in nonmetallic solids.

Electromagnetic fields and optical communication: numerical and approximate methods for calculation of electromagnetic fields in inhomogeneous and anisotropic structures (related to biological effects of electromagnetic fields); evaluation of mode characteristics in optical and infrared waveguides.

Systems theory: control and estimation theory; multivariable systems; nonlinear systems, modeling of deterministic and stochastic systems; model order reduction; optimal smoothing, filtering, and prediction; computerized imaging systems and image analysis.

Master of Science

Admission requirements: GRE and B.S. degree in electrical or computer engineering, engineering science, physics, mathematics, or computer science. Preparation in related fields such as aeronautical, civil, chemical, and mechanical engineering or in the life sciences may be acceptable.

Program requirements: thesis or nonthesis option. Individual programs are designed in accordance with the students' backgrounds and interests, but the thesis option requires permission of the chairperson. Thesis or nonthesis option: minimum of 30 credits in science and engineering with a minimum of 18 credits in graduate-level electrical engineering courses. Attendance at the departmental seminar (ELE 601, 602) is required of all students in graduate residence. Programs of study require departmental and Graduate School approval. In the nonthesis option a written master's examination and one course involving significant independent research and a substantial paper are required.

Doctor of Philosophy

Admission requirements: GRE and M.S. degree or equivalent in electrical engineering, engineering science, physics, mathematics, or computer science.

Program requirements: qualifying examination may be required. A minimum of 42 credits beyond the M.S. degree, 18–24 of which are course credits. The other 18–24 are dissertation credits. A comprehensive examination taken after all formal course work is completed. Attendance at the departmental seminar (ELE 601, 602) is required of all students in graduate residence. Dissertation research makes use of major modern laboratories in the listed areas of specialization.

ELE Courses
Electrical Engineering

401 Lasers, Optical Systems, and Communications *(I, 4)*
405 Digital Computer Design *(II, 3)*
408 Computer Organization Laboratory *(II, 4)*
427 Electromechanical Systems Laboratory *(I, 4)*
432 Electrical Engineering Materials *(II, 4)*
436 Communication Systems *(I, 4)*
437 Computer Communications *(II, 3)*
443 Electronics II *(I, 5)*
444 Advanced Electronic Design *(II, 4)*
447 VLSI Design and Simulation *(II, 4)*
457 Feedback Control Systems *(I, 3)*
458 Systems Laboratory: Digital Control Laboratory *(II, 4)*
482 Biomedical Engineering Seminar *(II, 1)*
491, 492, 493 Special Problems *(I and II, 1 each)*

495 Electrical Engineering Practice I *(I, II, or SS, 3)*

501 Linear Transform Analysis *(I, 3)* Fourier and Laplace transform analysis of continuous-time systems, causality and spectral factorization, evaluation of inverse transforms, z-transform analysis of discrete-time systems, Hilbert transforms, discrete Fourier transforms, generalized transforms. *(Lec. 3)* Staff

502 Nonlinear Control Systems *(II, 3)* Analysis of nonlinear systems: phase-plane analysis, Lyapunov theory, advanced stability theory, describing functions, design of nonlinear control systems: feedback linearization, sliding control. *(Lec. 3) Pre: 503 or permission of instructor.* Staff

503 (or MCE 503) Linear Control Systems *(I or II, 3)* State-variable description of continuous-time and discrete-time systems, matrices and linear spaces, controllability and observability, pole-placement methods, observer theory and state reconstruction, modern control systems design. *(Lec. 3) Pre: 313 or MCE 366 or equivalent.* Staff

504 (or MCE 504) Optimal Control Theory *(II, 3)* Quadratic performance indices and optimal linear control, frequency response properties of optimal feedback regulators, state estimation, separation theorem, optimal control of nonlinear systems, Pontryagin's minimum principle. *(Lec. 3) Pre: 503.* Staff

506 Digital Signal Processing *(II, 3)* Digital representations of signals and noise; sampling and aliasing; design of digital-processing systems for signal parameter estimation and signal detection; digital filter structures; discrete Fourier transform and FFT algorithm, periodogram. *(Lec. 3) Pre: 501 and 509.* Staff

509 Systems with Random Inputs *(I or II, 3)* Discrete and continuous linear systems with random inputs. Introduction to random processes in the context of linear systems. Applications to detection, smoothing, and prediction. *(Lec. 3) Pre: knowledge of differential equations, linear systems, and transform methods.* Staff

510 Communication Theory *(II, 3)* Communication theory for discrete and continuous channels. Optimum-receiver principles and signal design. Channel models, modulation techniques, data compression, speech and image coding, architecture and topology of communication networks. *(Lec. 3) Pre: 509.* Staff

511 Engineering Electromagnetics *(I, 3)* Review of electrostatics and magnetostatics. Maxwell's equations, wave propagation in dielectric and conducting media. Boundary phenomena. Radiation from simple structures. Relations between circuit and field theory. *(Lec. 3)* Staff

515 Quantum Electronics *(I or II, 3)* Laser engineering and applications, interaction of radiation with atoms, optical resonators, electro-optic modulation, harmonic generation, parametric oscillation and frequency conversion, noise in laser amplifiers and oscillators. *(Lec. 3) Pre: PHY 341 or permission of instructor.* Staff

525 Fiber Optic Communication Systems *(II, 3)* Survey of important topics in optical communication devices and systems. The physical principles and operation of lasers, LEDs, fibers, and detectors are covered. *(Lec. 3) Pre: 323, 331, 401 or equivalent.* Lengyel

526 Fiber Optic Sensors *(II, 3)* Theory and performance of different types of intensity-, phase-, and polarization-modulated fiber optic sensors (FOS) and their application areas. Properties of various active and passive devices used in building FOS. *(Lec. 3) Pre: 401 or equivalent.* Sunak

527 Current Topics in Lightwave Technology *(I, 3)* Current topics of importance in lightwave technology including coherent fiber optical communication systems, optical amplifiers, active and passive single-mode devices, infrared optical fibers. Material will be taken from recent literature. *(Lec. 3) Pre: 525 or equivalent.* Sunak

531 Solid State Engineering I *(I or II, 3)* Review of quantum mechanics, crystal properties, energy-band theory, introduction to scattering, generation-recombination processes, Boltzmann's transport equation, semiconductor junctions, devices. *(Lec. 3) Pre: 331 or equivalent.* Staff

532 Solid State Engineering II *(I or II, 3)* Properties of insulators, semiconductors, conductors, and superconductors from quantum mechanical principles. Semiconductor physics and band theory of solids as applied to current semiconductor and optoelectronic devices. *(Lec. 3) Pre: 531 or equivalent.* Staff

536 Semiconductor Electronics *(I or II, 3)* Theory and technology of semiconductor devices. Junction, field effect, optoelectronic and microwave devices. Integrated circuits. *(Lec. 3) Pre: 331 or equivalent.* Sadasiv

537 VLSI System Design *(I or II, 3)* Very large-scale integration. Silicon technology; NMOS, CMOS, and bipolar devices; circuits, and digital subsystems; computer-aided design and analysis of VLSI circuits; VLSI and digital system architecture. *(Lec. 3) Pre: graduate standing or senior standing with permission of instructor.* Sadasiv

538 Principles of Remote Sensing *(I or II, 3)* Theory and techniques of remote sensing including spaceborne photometry and radiometry. Applications selected from the following topics: planetary atmospheres, geology and earth resources, environmental problems. *(Lec. 3) Pre: 323, PHY 406, or permission of instructor.* Staff

539 Analog VLSI *(I or II, 3)* Theory and techniques of analog MNOS and CNOS integrated circuits. Device modeling, circuit simulation, and chip design are studied using amplifiers, A/Ds, and switched-capacitor circuits as examples. *(Lec. 3) Pre: 537.* Daly

542 Fault-Tolerant Computing *(I or II, 3)* Fault and error modeling, reliability modeling and evaluation, fault-tolerant computer systems, digital and mixed analog/digital VLSI testing, concurrent error detection, and design for VLSI yield enhancement. *(Lec. 3) Pre: 405 or equivalent or permission of instructor.* Staff

544 Computer Arithmetic for VLSI *(II, 3)* Review of number systems and computer arithmetic: hardware implementation of fixed- and floating-point adders, multipliers and dividers; VLSI implementation of residue arithmetic finite fields; error analysis and time/gate complexity of arithmetic operations. *(Lec. 3) Pre: 405.* Kumaresan

545 Design of Digital Circuits *(I, 3)* Design techniques for digital computers and controllers. Combinatorial and sequential circuits, minimization techniques, fast arithmetic circuits, memory and control circuits, floating-point hardware, Turing machines, coders and decoders, microprogramming, sequence generators. *(Lec. 3) Pre: 405 or equivalent.* Staff

546 Computer-Based Instrumentation *(I, 3)* Design of memory systems, input-output techniques, direct memory access controllers, instrument buses, video displays, multiprocessors-coprocessors, real-time operations, device handler integration into high-level language and mass storage. *(Lec. 2, Lab. 3) Pre: 205, 314, and concurrent enrollment in 405.* Ohley and Sun

548 Computer Architecture *(I or II, 3)* Classification and taxonomy of different computer architectures. Pipelining and RISC machines, vector and array processors, multiprocessors, dataflow computers. Cache memory and virtual memory systems, and multiprocessor algorithms. *(Lec. 3) Pre: 405.* Staff

549 Computer System Modeling *(I, 3)* Basic techniques used in computer system modeling, queueing theory, stochastic processes, Petri net, product form networks, approximation techniques, solution algorithms and complexity, computer simulation, performance studies of modern computer systems. *(Lec. 3) Pre: 548 and 509 or concurrent enrollment in MTH 451.* Staff

571 Underwater Acoustics I
See Ocean Engineering 571.

575 (or MTH 575) Approximation Theory and Applications to Signal Processing *(II, 3)* Interpolation; uniform approximation; least squares approximation; Hilbert space; the projection theorem; computation of best approximations; applications to the design of filters and beamformers, position location and tracking, signal parameter estimation. *(Lec. 3) Pre: advanced calculus, elements of the theory of functions of a complex variable, and elements of linear algebra.* Staff

581 Special Topics in Artificial Intelligence
See Computer Science 581.

583 (or CSC 583) Computer Vision *(I, 3)* Algorithms used to extract information from two-dimensional images. Picture functions. Template matching. Region analysis. Contour following. Line and shape descriptions. Perspective transformations. Three-dimensional reconstruction. Image sensors. Interfacing. Applications. *(Lec. 3) Pre: MTH 362 or equivalent.* Staff

584 (or STA 584) Pattern Recognition *(II, 3)* Random variables, vectors, transformations, hypothesis testing, and errors. Classifier design: linear, nonparametric, approximation procedures. Feature selection and extraction: dimensionality reduction, linear and nonlinear mappings, clustering, and unsupervised classification. *(Lec. 3) Pre: 509, CSC 410 or introductory probability and statistics, and knowledge of computer programming.* Staff

588 Biomedical Engineering *(I, 3)* Modeling of biosystems. Electrical properties of biological materials. Electrocardiography, vectorcardiography. Models of nerve propagation. *(Lec. 3) Pre: ZOO 345 or equivalent, knowledge of differential equations, senior or graduate standing.* Staff

591, 592 Special Problems *(I and II, 1–3 each)* Advanced work under supervision of a staff member arranged to suit individual requirements of student. *(Independent Study) Pre: graduate standing. May be repeated for a maximum of 6 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

601, 602 Graduate Seminar *(I and II, 1 each)* Seminar discussions including the presentation of papers based on research or detailed literature surveys. *(Sem. 1) Required of all graduate students with a maximum of 1 credit per year allowed. May be repeated for a maximum of 2 credits. S/U credit.* Staff

606 Digital Filter Synthesis *(I, 3)* Review of z-transforms and discrete-time systems, properties of digital-filter networks, design of finite and infinite-impulse-response filters, accuracy considerations for coefficients and data, hardware implementation, system examples. *(Lec. 3) Pre: 506 or equivalent.* Jackson

625 Guided Waves in Optical and IR Fibers *(I, 3)* Guided electromagnetic wave aspects of optical and IR fibers, novel approximation methods for solution of vectorial and scalar wave equations in optical fibers, theory of transparency and nonlinear optical interactions in solids as applied to design of optical fibers. *(Lec. 3) Pre: 511 and 525.* Mitra

630 Advanced Topics in Solid State *(I or II, 3)* Seminar for advanced students. Selected topics of current research interest. Material will be drawn primarily from recent literature. *(Lec. 3) Pre: 531, 532, or permission of instructor.* Staff

660 Advanced Topics in System Theory *(I or II, 3)* Seminar for advanced students. Selected topics of current research interest. Material will be drawn primarily from recent literature. *(Lec. 3) Pre: permission of instructor.* Staff

661 Estimation Theory *(I or II, 3)* Extraction of information from discrete and continuous data, best linear estimation, recursive estimation, optimal linear filtering, smoothing and prediction, nonlinear state and parameter estimation, design and evaluation of practical estimators. *(Lec. 3) Pre: 503 and 509.* Staff

665 Modulation and Detection *(I or II, 3)* Advanced treatment of modulation and detection theory. Minimum meansquare error, maximum likelihood, and maximum posterior probability estimators. Applications to communications systems and to radar and sonar systems. *(Lec. 3) Pre: 510.* Kay or Tufts

670 Advanced Topics in Signal Processing *(I or II, 3)* Seminar for advanced students. Selected topics of current research interest. Material will be drawn primarily from recent literature. *(Lec. 3) Pre: 506 and 606.* Staff

672 Underwater Acoustics II
See Ocean Engineering 672.

677 Statistical Sonar Signal Processing
See Ocean Engineering 677.

691, 692 Special Problems *(I and II, 1–3 each)* Advanced work under supervision of a staff member arranged to suit individual requirements of a student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 6 credits. S/U credit.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

English

M.A., Ph.D.
401-792-5931

Graduate Faculty

Chairperson: Associate Professor RB Reaves, Jr., Ph.D., 1971, University of Wisconsin
Director of Graduate Studies: Professor Karen F. Stein, Ph.D., 1982, University of Connecticut
Professor Paul G. Arakelian, Ph.D., 1975, Indiana University
Professor Walter L. Barker, Ph.D., 1966, University of Connecticut
Professor Josie P. Campbell, Ph.D., 1972, Pennsylvania State University
Professor Lois Cuddy, Ph.D., 1975, Brown University
Professor Dorothy F. Donnelly, Ph.D., 1979, Brandeis University
Professor Wilfred P. Dvorak, Ph.D., 1972, Indiana University
Professor Don R. Kunz, Ph.D., 1968, University of Washington
Professor John R. Leo, Ph.D., 1972, Northwestern University
Professor Allan H. MacLaine, Ph.D., 1951, Brown University
Professor Francis X. Mathews, Ph.D., 1964, University of Wisconsin
Professor Richard T. Neuse, Ph.D., 1959, Yale University
Professor Daniel D. Pearlman, Ph.D., 1968, Columbia University
Professor Robert A. Schwegler, Ph.D., 1977, University of Chicago
Professor Jules P. Seigel, Ph.D., 1965, University of Maryland
Professor Ralph M. Tutt, Ph.D., 1966, Duke University
Associate Professor Sally F. Burke, Ph.D., 1978, University of Connecticut
Associate Professor Walter Cane, Ph.D., 1966, Vanderbilt University
Associate Professor Mathilda M. Hills, Ph.D., 1970, Duke University
Associate Professor Dorothy Jacobs, Ph.D., 1968, University of Michigan
Associate Professor Celest A. Martin, Ph.D., 1979, University of Southern California
Associate Professor Thomas H. McCabe Ph.D., 1968, University of Wisconsin
Associate Professor F.E. Okeke-Ezigbo, Ph.D., 1979, State University of New York, Buffalo
Associate Professor Eric T. Schoonover, A.M., 1959, University of Michigan
Associate Professor Linda Shamoon, M.A., 1967, Tufts University
Associate Professor M. Beverly Swan, Ph.D., 1977, Boston University
Assistant Professor Mary Cappello, Ph.D., 1988, State University of New York, Buffalo
Assistant Professor Gitahi Gititi, Ph.D., 1990, University of Minnesota
Assistant Professor William L. Mensel, Jr., Ph.D., 1974, University of Washington
Assistant Professor Nedra Reynolds, Ph.D., 1991, Miami University, Ohio
Assistant Professor Dana R. Shugar, Ph.D., 1991, University of Iowa
Assistant Professor Sue Fisher Vaughn, M.A., 1966, Miami University, Ohio
Assistant Professor Jean Walton, Ph.D., 1988, State University of New York, Buffalo
Professor Emerita Nancy A. Potter, Ph.D., 1954, Boston University; L.H.D., 1967, University of Rhode Island
Professor Emerita Edna L. Steeves, Ph.D., 1948, Columbia University
Associate Professor Emerita Marilyn J. Malina, Ph.D., 1967, University of Virginia

Specializations

For the M.A. and for the Ph.D.: historical periods, genres, and major authors in British and American literature; critical theory; gender studies; rhetoric and composition studies; cultural studies/media/film theory.

Master of Arts

Admission requirements: a minimum of 21 credits in English or related courses with a quality point average of B (3.00 on a 4.00 scale) or better in all English courses. Applicants with diverse academic backgrounds are encouraged to apply. Completed application packages are to be sent directly to the Director of Graduate Studies, English Department, University of Rhode Island, Independence Hall, and must be received by January 25. Applications received after January 25 will be reviewed on a space-available basis until the program is filled. Applicants will be accepted for September admission only. Nonnative speakers of English must have a minimum score of 630 on the TOEFL in order to be considered for admission.

Program requirements: 24 credits plus thesis (6 credits); *OR* 30 credits (including two 600-level seminars) plus a comprehensive examination based on a departmental reading list and a course requiring a substantial paper involving significant independent study. The specialization in rhetoric and composition studies requires WRT 512, 535 and ENG 680, 681.

Doctor of Philosophy

The Doctor of Philosophy program is small and selective. Admission is competitive and based mainly on academic merit, demonstrated capability to do research, and the match of research interests between the applicant and faculty in indicated or developing areas of specialization.

Admission requirements: M.A. in English or equivalent. Although grades are not the only criterion, applicants having less than a 3.30 quality point average (on a 4.00 scale) have a low probability for admission. Completed application packages should be sent to the Director of Graduate Studies, English Department, University of Rhode Island, Independence Hall, and must be received by January 25. Applicants will be accepted for September admission only. Applications received by January 25 will be given a full review; applications received after that deadline, but before July 15, will be reviewed on a space-available basis until the program is filled. GREs (both general and subject) are requested but not required; a writing sample of 15 pages maximum is required. Nonnative speakers of English must have a minimum score of 630 on the TOEFL in order to be considered for admission. Applicants with diverse academic backgrounds are encouraged to apply.

Program requirements: 24 credits (including a minimum of four 600-level courses) plus 18 credits of dissertation research. Written comprehensive examinations in three nonoverlapping areas, one of which must be critical methodology. Oral examination based on the dissertation proposal. For specialization in rhetoric and composition studies, WRT 512, 535 and ENG 680, 681 are required. A limited number of 500- and 600-level courses in other departments and programs may be used for program credit if approved as part of the student's program of study before the courses are taken. (In some cases, a research tool may be required by a student's doctoral committee in consultation with the Director of Graduate Studies.)

Financial Aid

All requests for tuition waivers, assistantships, and fellowships should be sent to the Director of Graduate Studies. In addition to teaching assistantships, there is an editorial graduate assistantship for the *ATQ: American Transcendental Quarterly*, a journal of nineteenth-century literature and culture. Complete applications for assistantships must accompany the application packet. Priority will be given to applications received by January 25; thereafter, assistantships will be awarded on a space-available basis.

Note: In 1995, the graduate curriculum will be revised, and some of the following courses will be changed.

ENG Courses
English

445 Ethnic Images in American Literature *(II, 3)*
446 Modern Drama *(I and II, 3)*
447 Modern British and American Poetry *(I and II, 3)*
448 Traditions of the American Novel *(I and II, 3)*
458 Traditions of the British Novel *(I and II, 3)*
468 Traditions of the Continental Novel *(I and II, 3)*
469 The Modern Novel *(I and II, 3)*
472 Shakespeare's Plays *(I and II, 3)*
474 (or AAF 474) Topics in Pan-African Literature *(II, 3)*
477 Traditions of British Drama *(I and II, 3)*
485 American Authors *(I or II, 3)*
486 British Authors *(I or II, 3)*
488 (or WRT 488) Traditions of Nonfiction *(I, 3)*

All 500-level courses require graduate standing or permission of instructor. All courses except ENG 510 may be repeated if emphasis changes.

510 Bibliography and Literary Research *(I or II, 3)* Use of descriptive and analytical bibliography, various modes of literary criticism, and other scholarly tools in the solution of literary research problems. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1996.* Steeves

530 History of the English Language *(I, 3)* Historical study of development of English syntax, sounds, vocabulary, and usage. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Arakelian

531 History of Critical Theory *(I, 3)* Important critical theories from Aristotle to the twentieth century. Emphasis on orientation of theories to various aspects of the literary situation. Some study of modern attitudes toward earlier critics. *(Lec. 3) Pre: senior or graduate standing or permission of instructor. Next offered fall 1995.* Staff

532 Modern Literary Criticism *(I, 3)* Dominant modes and schools of criticism exemplified by T.S. Eliot, T.E. Hulme, I.A. Richards, Edmund Wilson, John Crowe Ransom, and other important critics. Pertinent related literary works. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

534 Structure of the English Language *(I or II, 3)* Synchronic study of American morphology, phonology, and syntax, and the application of linguistic methodology to the teaching and analysis of literature and composition. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Arakelian

535 Old English *(II, 3)* Introduction to the language and literature. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1996.* Mensel

540 Modern American Novel *(I, 3)* Important American novelists of the twentieth century with emphasis on major developments in ideas and techniques. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

545 Problems in American Realism and Naturalism *(I, 3)* Readings, discussions, and papers on stylistic, thematic, and philosophic issues relating to literary artists like Howells, James, Crane, Dreiser, Hemingway, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

546 Problems in American Romanticism *(I, 3)* Major themes and works of such authors as Poe, Emerson, Thoreau, Hawthorne, Melville, Whitman, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

547 Early American Literature to 1800 *(II, 3)* Thorough examination of colonial and federal literature, some discussion of beginnings of Romanticism. Special attention to Taylor, Edwards, Franklin, Fremeau, and Charles Brockden Brown. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1996.* Staff

549 Modern American Poetry *(I or II, 3)* In-depth study of several major American poets, such as Eliot, Pound, Frost, Stevens, Williams, and others; or of a school such as the Imagists, the Fugitives, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

550 Middle English Literature *(I or II, 3)* Selections from Middle English literature exclusive of Chaucer. Works by Malory, the Pearl Poet, Gower, the Wakefield Master, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* MacLaine

551 The Metaphysical Poets *(I, 3)* Intensive analysis and interpretation of poetry of Donne, Herbert, Vaughan, Crashaw, and Marvell. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

554 Modern British Poetry *(I, 3)* In-depth study of several major British poets, such as Yeats, Lawrence, Auden, Thomas, MacNeice, and others; or of a school such as the War Poets (WW I), and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* Staff

555 Modern British Novel *(I, 3)* Important British novelists of the twentieth century with emphasis on major trends in ideas and techniques. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* Mensel

556 English Literature of the Sixteenth Century *(II, 3)* Early humanism. Tudor poetry and its continental antecedents. Satire and translation. Elizabethan voyage literature. Writers chosen from More, Erasmus, Skelton, Wyatt, Surrey, Sidney, Spenser, Marlowe, Hakluyt, Lodge, Shakespeare, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* Staff

557 English Literature of the Seventeenth Century *(I, 3)* Selected poets and prose writers, studied for their contribution to the dominant themes and modes of expression of the Stuart and Cromwellian eras. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* Jacobs

558 English Literature of the Eighteenth Century *(II, 3)* Intensive study of major and selected minor figures of the eighteenth century. Emphasis on verse and nonfiction prose, some attention to developments of the drama. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1994.* Staff

559 English Literature of the Romantic Period *(I, 3)* Selections from the major works and writers of the Romantic Movement. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

560 English Literature of the Victorian Period *(II, 3)* Selections from the major works and writers of the Victorian period. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Dvorak

561 Modern European Novel *(II, 3)* Major developments in the European novel during the twentieth century. Special attention to Proust, Mann, Kafka, Moravia, Silone, Lagerkvist, Malraux, and Camus. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

571 Problems in Chaucer *(II, 3)* Intensive study of selected aspects of Chaucer's achievements as a poet. Emphasis on *The Canterbury Tales*. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

573 Problems in Shakespeare *(II, 3)* Primarily a discussion course, concentrating on plays and characters that offer most interesting problems for student analysis. Solutions by leading critics are examined. *(Lec. 3) Pre: permission of instructor. Next offered fall 1994.* Staff

574 The Scots' Poetic Tradition Through Robert Burns *(II, 3)* Intensive study of the poetry of Robert Burns, Ferguson, Ramsay, and others who sparked the Scottish revival. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

575 Modern Southern Literary Renaissance *(II, 3)* Comprehensive study of a major literary movement. Representative works by Faulkner, Wolfe, Warren, Williams, Porter, Welty, O'Connor, and others. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Tutt

576 English Novel of the Eighteenth Century *(II, 3)* Selected novels of Defoe, Richardson, Fielding, Smollett, Sterne, and Austen, with consideration of major criticism and of disparate influences on the emergence of the novel. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Reaves

577 English Novel of the Nineteenth Century *(II, 3)* Important British novelists of the nineteenth century with emphasis on trends in ideas and techniques of Victorian novelists. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

578 Problems in Milton *(II, 3)* Emphasis on the major poetic works. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

580 Selected Topics in Women and Literature *(I or II, 3)* Selected topics in literature by and about women. *(Lec. 3) Pre: graduate standing or permission of instructor.* Staff

590 Selected Topics *(I and II, 3)* Selected topics in American and British literature and topics of special interest not covered by traditional department offerings. *(Independent Study) Pre: graduate standing or permission of instructor. Next offered spring 1996.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

All 600-level (seminar) courses require graduate standing or permission of instructor. Courses include: specialized topics, intensive readings, occasional lectures, and frequent presentation of ongoing research by students. A substantial research project is required. May be repeated if emphasis changes.

640, 641 Seminar in American Literature Before 1900 *(I or II, 3 each)* Staff

643 Seminar in Modern Literature (American) *(I or II, 3)* Staff

650 Seminar in English Literature of the Middle Ages *(I or II, 3)* Staff

652 Seminar in English Literature of the Sixteenth Century *(I or II, 3)* Staff

655 Seminar in English Literature of the Seventeenth Century *(I or II, 3)* Staff

657 Seminar in English Literature of the Eighteenth Century *(I or II, 3)* Staff

658 Seminar in English Literature of the Nineteenth Century *(I or II, 3)* Staff

660, 661 Seminar in Modern Literature (English) *(I and II, 3 each)* Staff

670, 671 Seminar in Special Literary Problems *(I and II, 3 each)* Readings in literature which present special problems not addressed by traditional department offerings. Seminar topics may be offered from time to time based on student request. *(Seminar)* Staff

680, 681 Seminar in Special Rhetorical Problems *(I and II, 3 each)* Readings in rhetoric which present special problems not addressed by traditional department offerings. Seminar topics may be offered from time to time based on student request. *(Seminar) Pre: graduate standing or permission of instructor. Next offered spring 1995.* Staff

691, 692 Independent Graduate Study *(I and II, 3 each)* Advanced study of an approved topic under the supervision of a staff member. *(Independent Study) Pre: permission of chairperson.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

WRT Courses
Writing

435 (or EDC 435) The Teaching of Composition *(I and II, 3)*

488 (or ENG 488) Traditions of Nonfiction *(I, 3)*

512 Modern Rhetorical Theory *(I, 3)* An introduction to theories of rhetoric and their relation to literature and language. Includes D'Angelo, Kinneavy, Winterowd, Perelman, Booth, and Burke. Pertinent related literary works. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Staff

535 Theories and Strategies in the Teaching of Writing *(II, 3)* An introductory course in theories and pedagogy of rhetoric. Readings and lectures cover the current research in composition, including such areas as ESL and business or technical communications. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered spring 1996.* Staff

999 Methods of Teaching College Writing *(I and II, 0)* Materials and multiple methods of teaching writing on the college level. Required of teaching assistants who will teach in the College Writing Program unless waived by the Director of English Graduate Studies, the supervisor of teaching assistants, and the Director of the College Writing Program. *(Seminar)* Staff

Entomology

M.S.
401-792-2791

Graduate Faculty

Chairperson: Professor Richard J. Hull, Ph.D., 1964, University of California
Director of Graduate Studies: Associate Professor Joel M. Chandlee, Ph.D., 1984, North Carolina State University
Professor Richard A. Casagrande, Ph.D., 1975, Michigan State University
Professor Roger A. LeBrun, Ph.D., 1977, Cornell University
Professor Patrick A. Logan, Ph.D., 1978, Michigan State University
Associate Professor Steven R. Alm, Ph.D., 1985, Ohio State University
Associate Professor Thomas N. Mather, Ph.D., 1983, University of Wisconsin
Adjunct Associate Professor Howard S. Ginsberg, Ph.D., 1979, Cornell University
Adjunct Assistant Professor Alan D. Gettman, Ph.D., 1989, University of Florida, Gainesville

Specializations

Entomology: insect ecology, pest management, aquatic entomology, and biology and ecology of disease-transmitting arthropods.

Plant protection: integrated pest management, plant-insect interactions, and biological control.

Master of Science

Admission requirements: GRE and undergraduate major in biological, agricultural, or physical sciences. Fundamental courses in biological sciences, mathematics, and chemistry may be required to make up deficiencies without graduate credit.

Program requirements: course work as determined by graduate committee, three departmental seminars which include a final thesis seminar, and a thesis.

For courses, also see listing under Plant Sciences.

ENT Courses
Entomology

529 Systems Science for Ecologists *(I, 3)* Concepts and techniques for computer analysis and simulation of complex biological systems. *(Lec. 3) Pre: PLS 141, BOT 262, or permission of instructor.* Logan

533 Graduate Writing in Life Sciences *(II, 3)* Graduate writing skills for the life and environmental sciences; writing and editing journal articles, proposals; rhetorical analysis of scientific writing. *(Lec. 2, Lab. 2) Pre: WRT 101 or equivalent or permission of instructor. Graduate standing or senior status.* Logan and Vaughn

550 Insect Morphology and Systematics *(I, 3)* External morphology of insects and taxonomy of major families. *(Lec. 2, Lab. 2) Pre: 385. In alternate years. Next offered fall 1995.* Logan

555 Insect Pest Management *(II, 3)* Evaluation of past and present pest-control strategies in light of insect ecology. Development of pest-management systems emphasizing biological control, resistant plants, and ecosystem redesign. *(Lec. 3) Pre: PLS 200 or ENT 385 or permission of instructor.* Casagrande

561 Aquatic Entomology *(I, 3)* Biology of insects in aquatic environments, including systematics, morphology, and ecology. Field trips emphasize relations between species and habitat and the role of insects in aquatic management programs. *(Lec. 2, Lab. 3) Pre: 385 or permission of instructor.* LeBrun and Logan

571 (or MIC 571) Insect Microbiology *(II, 3)* A two-part investigation of insect-microbe associations, concentrating on the comparative pathobiology of microbial agents in the insect host and the transmission of plant disease organisms by the insect vectors. *(Lec. 3) Pre: PLS 381 and MIC 211, or permission of instructor. In alternate years. Next offered 1994–95.* LeBrun

591, 592 Special Problems in Entomology *(I and II, 1–3 each)* Advanced independent research projects supervised by members of the research staff and unrelated to thesis research. Projects developed to meet individual needs. *(Independent Study) Pre: permission of chairperson.* Staff

599 Master's Thesis Research *(I and II, 1-6)* Number of credits determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit only.* Staff

Experimental Statistics

See Statistics on page 106.

Fisheries, Animal and Veterinary Science

M.S., Ph.D. (Biological Sciences)
401-792-2487

Graduate Faculty

Chairperson: Professor Murn M. Nippo, Ph.D., 1976, University of Rhode Island
Director of Graduate Studies: Professor Richard C. Rhodes, Ph.D., 1980, Texas A&M University
Professor Richard E. Wolke, Ph.D., 1968, University of Connecticut
Associate Professor Terence M. Bradley, Ph.D., 1983, University of Idaho
Associate Professor Joseph T. DeAlteris, Ph.D., 1986, College of William and Mary
Associate Professor Anthony T. Mallilo, Ph.D., 1982, Pennsylvania State University
Associate Professor Conrad W. Recksiek, Ph.D., 1972, University of Maine
Associate Professor Michael A. Rice, Ph.D., 1987, University of California, Irvine
Assistant Professor Ulysses G. Whitworth, D.V.M., 1976, Tuskegee Institute
Adjunct Associate Professor Joel Bodammer, Ph.D., 1974, University of Wisconsin
Adjunct Associate Professor Michael W. Fleming, Ph.D., 1980, Ohio State University
Adjunct Associate Professor Grace Klein-MacPhee, Ph.D., 1979, University of Rhode Island
Adjunct Associate Professor Jan Pechenik, Ph.D., 1978, University of Rhode Island
Adjunct Assistant Professor David Berlinsky, Ph.D., 1989, University of Rhode Island
Professor Emeritus Pei Wen Chang, Ph.D., 1965, Yale University
Associate Professor Emeritus Richard I. Millar, M.S., 1959, University of Rhode Island

MASTER OF SCIENCE

Specializations

ANIMAL AND VETERINARY SCIENCE

Animal science: regional, national, and global problems are studied in the areas of animal behavior, endocrinology, nutrition, physiology, and reproductive biology. Both domestic livestock and laboratory animals are used in a research context.

Animal health and disease: animal health problems of regional, national, and global significance are studied. Bacterial and viral diseases are characterized, and the contributions of stress and pathologic conditions to disease are considered.

FISHERIES AND AQUACULTURE

Aquaculture: aquaculture of salmonids and shellfish; genetics, nutrition, and physiology of fishes.

Fisheries: fisheries science and technology.

Aquatic pathology: pathology of aquatic animals; effects of environmental pollution on aquatic organisms.

Admission Requirements

GRE and an undergraduate major in the biological sciences with a concentration in animal science, fisheries technology, marine biology, microbiology, preveterinary medicine, or zoology, or postgraduate professional degrees (M.D., D.V.M., V.M.D.); one

year of organic chemistry and physics. Courses in statistics, histology, and physiology are strongly recommended.

Program Requirements

ANIMAL AND VETERINARY SCIENCE

Animal science: thesis and 24 credits of course work to include two credits of ASP 501 and/or 502; ASP 532; AVS 412, 472. Thesis topic and additional course work will be selected by the student after consultation with, and approval of, the major professor.

Animal health and disease: thesis and 24 credits of course work to include two semesters of graduate seminar, ASP 501 and/or 502; ASP 401, 532, 534. Thesis topic and additional course work will be selected by the student after consultation with, and approval of, the major professor.

FISHERIES AND AQUACULTURE

Fisheries: thesis and 24 credits of course work to include two semesters of graduate seminar, ASP 501 and/or 502; two courses in statistics (at least one at the 500 level); FST 415, 421. A total of 14 credits of ASP or FST course work must be included in the program of study. Thesis topic and additional course work will be selected by the student after consultation with, and approval of, the major professor.

Aquaculture: thesis and 24 credits of course work to include two semesters of graduate seminar, ASP 501 and/or 502; ASP 400, 483, 486, 581; BCH 581; STA 409. Thesis topic and additional course work will be selected by the student after consultation with, and approval of, the major professor.

Aquatic pathology: thesis and 24 credits of course work to include two semesters of graduate seminar, ASP 501 and/or 502; ASP 400, 486, 534, 536, 555, 556. Thesis topic and additional course work will be selected by the student after consultation with, and approval of, the major professor.

DOCTOR OF PHILOSOPHY (Biological Sciences)

Specializations

Animal virology: characterization of avian and marine viral infections; recovery of viruses from estuaries, streams, and ponds.

Aquatic pathology: pathology of aquatic animals; effects of environmental pollution on marine organisms.

Admission Requirements

Same as for master's degree, plus Ph.D. qualifying exam.

Program Requirements

Animal virology: enrollment in two semesters of graduate seminar; ASP 534, 536, 538; BCH 581, 582; MIC 432, 533, 552, 641. Suggested courses include BCH 622, 624. Dissertation topic and additional course work will be selected by the student after consultation with, and approval of, the major professor. Comprehensive examination and dissertation.

Aquatic pathology: enrollment in two semesters of graduate seminar, ASP 400, 401, 486, 534, 536, 555, 556; BCH 581, 582; STA 532. Suggested courses include ASP 538, 584, 586; BCH 622, 624; MIC 533. Dissertation topic and additional course work will be selected by the student after consultation with, and approval of, the major professor. Comprehensive examination and dissertation.

ASP Courses
Aquacultural Science and Pathology

400 Diseases of Cultured Fishes *(I, 3)*
401 Pathobiology *(I, 3)*
476 The Genetics of Fish *(I, 3)*
481 Shellfish Aquaculture Laboratory *(I, 2)*
483 Salmonid Aquaculture *(I, 3)*
486 Applied Physiology of Fish *(II, 3)*

501, 502 Seminar *(I and II, 1 each)* Preparation and presentation of scientific papers on selected subjects in animal pathology and virology. *(Seminar)* Wolke

532 Experimental Design
See Statistics 532.

534 (or MIC 534) Animal Virology *(I, 3)* Basic properties, classification, and evolution of animal viruses. Individual agents are studied in detail. *(Lec. 3) Pre: MIC 432, 533, or permission of chairperson.* Chang

536 (or MIC 536) Virology Laboratory *(I, 2)* Methods employed in diagnosis and for the investigation of the biological, physical, and chemical properties of animal viruses. *(Lab. 6) Pre: credit or concurrent enrollment in 534.* Chang

538 (or MIC 538) Epidemiology of Viral and Rickettsial Diseases *(II, 2)* Principles of epidemiology. Interrelationships of host, environment, and agent in viral and rickettsial diseases. *(Lec. 2) Pre: credit or concurrent enrollment in 534. In alternate years. Next offered 1995–96.* Chang

555, 556 Pathology Rotation *(I and II, 3 each)* Applied anatomical and clinical pathology of aquatic animals including necropsy duty and/or clinical hematology, chemistry, microbiology, parasitology. Attendance at weekly histopathology seminar and research/case report required. *(Lab. 6) Pre: one course in histology or ZOO 323, MIC 432, or permission of instructor. In alternate years. Next offered 1995–96.* Wolke

581 Current Topics in Molluscan Aquaculture *(I, 3)* Review and critical analysis of recent literature within the field of molluscan biology with emphasis on application to mariculture techniques. Student presentation of selected topics and field trips to state-of-the-art mariculture facilities. *(Lec. 3) Pre: graduate standing or senior standing with permission of instructor.* Rice

584 Advanced Aquaculture Systems *(II, 3)* Development of design criteria, operational analysis, and management of selected species in water reuse systems. *(Lec. 2, Lab. 2) In alternate years. Next offered 1995–96.* Staff

586 Fish Nutrition *(I, 3)* Digestion and metabolism of carbohydrate, protein, and lipids by fish. Role of vitamins and minerals in metabolism and associative nutritional diseases resulting from deficiencies. Inadvertent toxic factors in fish feeds. *(Lec. 3) Pre: 412 and CHM 228 or equivalent. In alternate years. Next offered 1995–96.* Staff

591, 592 Special Projects *(I and II, 1–3 each)* Research projects in animal pathology, virology, and aquaculture. *(Independent Study) Pre: graduate standing or permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

AVS Courses
Animal and Veterinary Science

412 Animal Nutrition *(I, 3)*
420 Animal Breeding and Genetics *(II, 3)*
462 Laboratory Animal Techniques *(II, 3)*
463 Animal Veterinary Technology *(II, 3)*
472 Physiology of Reproduction *(II, 3)*
491, 492 Special Projects *(I and II, 1–3 each)*

591, 592 Research Problems *(I and II, 3 each)* Research problems to meet individual needs of graduate and honors students in the field of animal breeding, nutrition, or physiology and food science. *(Independent Study) Pre: permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

FST Courses
Fisheries Science and Technology

415 Fishery Science *(I, 3)*
421 Design of Fish Capture Systems *(I, 3)*

510 Applied Problems in Marine Fisheries Ecology *(I, 3)* A study of the interaction between the marine environment and the fisheries, the effects of the environment on individual fish, the life histories of fish, fish behavior, and fish migration. *(Lec. 2, Lab. 3) Pre: permission of instructor.* DeAlteris

516 Early Life History of Aquatic Resource Animals *(II, 3)* Biology and ecology of juvenile and planktonic commercially important species; dynamics of reproduction, fecundity, growth, distribution, and behavior as modulated by the physical environment; identification, enumeration, and sampling. *(Lec. 2, Lab. 3) Pre: 415 and STA 308.* Recksiek

521 Evaluation of Fish Capture System *(II, 3)* Evaluation of fish capture system behavior and performance using empirical, theoretical, model scaling, and statistical analysis techniques. Field and laboratory measurement procedures. *(Lec. 2, Lab. 3) Pre: 421 or permission of instructor.* DeAlteris

591, 592 Special Problems *(I and II, 1–3 each)* Advanced work under the supervision of a staff member arranged to suit individual needs of students in various fields of fisheries and marine technology. *(Independent Study) Pre: graduate standing or permission of chairperson.* Staff

MRD Courses
Marine Resource Development

433 (FST) Research Diving Methods *(I, 3)*
481 Applied Problems in Marine Resource Development I *(I, 3)*
482 Applied Problems in Marine Resource Development II *(II, 3)*
491, 492 Special Problems and Independent Study *(I and II, 1–3 each)*

Food Science and Nutrition

M.S., Ph.D. (Biological Sciences)
401-792-2466

Graduate Faculty

Chairperson: Professor Richard W. Traxler, Ph.D., 1958, University of Texas
Professor Marjorie J. Caldwell, Ph.D., 1972, Cornell University
Professor Spiros M. Constantinides, Ph.D., 1966, Michigan State University
Professor Chong Min Lee, Ph.D., 1974, University of Rhode Island
Professor Arthur G. Rand, Jr., Ph.D., 1964, University of Wisconsin
Professor Kenneth L. Simpson, Ph.D., 1963, University of California
Associate Professor Catherine English, Ph.D., 1993, University of Connecticut
Associate Professor Ruth E. Eshleman, Ed.D., 1975, Teachers College, Columbia University
Associate Professor Leonard Gerber, Ph.D., 1979, University of Illinois
Associate Professor Geoffrey W. Greene, Ph.D., 1984, Pennsylvania State University
Assistant Professor Anthony S. Fischl, Ph.D., 1986, Rutgers—The State University
Adjunct Professor Edward S. Josephson, Ph.D., 1940, Massachusetts Institute of Technology
Adjunct Associate Professor Linda Sebelia, M.S., 1974, Ohio State University

Specializations

Food science: seafood utilization by preservation and product development, seafood quality assessment, fabricated surimi-based products; food quality control and safety; food engineering; environmental microbiology; biotechnology applications of bioprocessing and fermentation; biochemical and physical properties of foods; and international food technology.

Nutritional science: nutritional status and food habits of population groups; vitamin A and provitamin A analysis and metabolism; nutrition policy; nutrition for athletes and in weight control—diet and exercise; aquacultural nutrition; nutrition and computers in foodservice management; and international nutrition.

Dietetics Experience Certificate Program

Admission requirements: cumulative undergraduate quality point average of 3.00 or better; an earned bachelor's degree with completion of the American Dietetic Association (ADA) Plan IV/V program requirements; and the ADA Verification Statement or ADA Declaration of Intent Form from their Plan IV/V program director. Six credits of acceptable course work in the discipline beyond the bachelor's degree are required for applicants whose bachelor's degrees were completed prior to 1986; at least 12 credits are required if the bachelor's degree was completed prior to 1981. Completion of the Graduate School application package and the PreProfessional Practice Program (AP4) application are required. Criteria used for admission include a balance of: a) academic achievement; b) relevant work experience; c) statement of purpose; and d) professional recommendations. Admission is for the fall term only. Fall 1994 enrollment is expected to be limited to eight students. Program information and application deadlines can be obtained by contacting the department.

Program requirements: The Dietetics Experience Certificate Program is an ADA-approved preprofessional practice program (AP4) and is administered under the department's nondegree status. The program consists of 46 weeks of course work and planned experiences in health care facilities in Rhode Island.

Master of Science

Admission requirements: GRE and bachelor's degree with adequate preparation in biochemistry, statistics, and in the area of proposed study. Students from other academic backgrounds are encouraged to apply, but some basic courses may have to be taken for no program credit. The completed application package must be received by April 15 for fall admission and November 15 for spring admission.

Program requirements: thesis; two credits of FSN 511; a minimum of three credits in biochemistry, chemistry, microbiology, or physiology; in food science, FSN 422, 431, 432, and 502, or, in nutritional science, a minimum of nine credits (FSN 505, 551, and 552). If the student has taken any of the courses as an undergraduate, alternate courses should be taken in the same area. All resident students are expected to be continuously registered in FSN 511 or 512, but no more than two credits of FSN 511 can be used for program credit.

Doctor of Philosophy

Admission requirements: GRE and master's degree in a physical or biological science. Students from other academic backgrounds are encouraged to apply, but some basic courses may have to be taken for no program credit. The completed application package must be received by April 15 for fall admission and November 15 for spring admission.

Program requirements: same as master's degree plus statistics (STA 532 or equivalent), a total of three credits in FSN 511, and a research problem (FSN 691, 692) under the supervision of an advisor other than the major professor. Comprehensive examination and dissertation. Each candidate must also gain teaching experience in at least one college-level course. All resident students are expected to be continuously registered in FSN 511 or 512, but no more than three credits of FSN 511 can be used for program credit. Qualifying examination is required for students admitted without a master's degree or without a strong background in the proposed area of study.

FSN Courses
Food Science and Nutrition

421 Food Analysis *(I, 4)*
422 (or MIC 422) Biotechnology of Industrial Microorganisms *(II, 3)*
431 Biochemistry of Food *(I, 3)*
432 Food Processing *(II, 3)*
433 Food Quality *(II, 3)*
434 Marine Food Processing *(II, 4)*
438 Food Chemistry Laboratory *(I, 3)*
441 Advanced Human Nutrition *(I, 3)*
444 Nutrition and Disease *(II, 3)*
447 (or CHE 447) Food Engineering I *(I, 4)*
458 Nutrition Education *(I and II, 3)*
461 Food Safety *(II, 3)*
491, 492 Special Projects *(I and II, 1–3 each)*

502 Physical Chemistry and Properties of Food *(I, 3)* Principles of physical chemistry and properties of food material. Analysis of changes in physical properties and interaction of food components during physical processing. Application of underlying principles in food formulation and processing. *(Lab. 6) Pre: 431 or permission of chairperson.* Lee

503 Food Science and Nutrition Research Methods *(I, 4)* Theory and practice in techniques and methods as applied to research in food science and nutritional science. *(Lab. 8) Pre: permission of chairperson.* Simpson

504 Research Methods in Dietetics *(SS, 3)* Research methods and techniques applied to the field of dietetics. Research project designed by each student. *(Lec. 3) Pre: 951, 952, and 953, or permission of instructor.* Greene

505 Methods in Nutrition Research *(II, 3)* Theory and laboratory experience in research methodology related to nutrition. Critical review of articles, completion of laboratory projects, and preparation of a research proposal. *(Lec. 2, Lab. 2) Pre: STA 308 and FSN 444 or permission of instructor.* Greene

511 Food Science and Nutrition Seminar I *(I and II, 1)* Reports and discussions of current topics in food science and nutrition, as well as oral reports of theses and dissertation research topics in progress. *(Seminar) Pre: graduate standing or permission of chairperson.* Staff

512 Food Science and Nutrition Seminar II *(I and II, 1)* Critical review of oral presentations presented in 511. Provides student with experience in communicative skills necessary to evaluate and critique scientific presentations. Attendance is required of all graduate students in residence when not enrolled in 511. *(Seminar) Pre: graduate standing. S/U credit.* Staff

523 Water Pollution Microbiology
See Microbiology 523.

525 Water Pollution Microbiology Laboratory
See Microbiology 525.

526 (or MCH 526) Lipid Chemistry *(I, 3)* Advanced course in the chemistry of biologically important lipids such as the fatty acids, neutral glycerides, phospholipids, steroids, and the chemistry and biochemistry of the carotenoids. *(Lec. 3) Pre: BCH 581. In alternate years. Next offered 1995–96.* Gerber and Simpson

532 Seafood Quality *(II, 3)* Biochemical and microbiological deterioration of seafoods, methods utilizing these reactions for quality assessment, and processes to inhibit these reactions for preservation of fresh seafoods. *(Lec. 1, Lab. 4) Pre: 421, 432 or permission of instructor. In alternate years. Next offered 1994–95.* Lee

548 Separations for Biotechnology
See Chemical Engineering 548.

551 Topics in Human Nutrition I *(I, 3)* Digestion, absorption, and metabolic role of macronutrients and their interrelationships. Influence of environmental and physiological factors on nutrient use and energy balance. Critical review of the literature. *(Lec. 3) Pre: ZOO 242, BCH 311, and FSN 441, or permission of instructor.* Caldwell

552 Topics in Human Nutrition II *(II, 3)* Absorption, metabolism, and role of micronutrients and their interrelationships. Critical review of the literature and implications for public policy. *(Lec. 3) Pre: ZOO 242, BCH 311, and FSN 441, or permission of instructor.* Caldwell

591, 592 Special Research Problems *(I and II, 1–4 each)* Advanced work under supervision of a staff member. Arranged to suit individual requirements of students. *(Independent Study) Pre: permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

691, 692 Research in Food Science and Nutrition *(I and II, 1–3 each)* Assigned research on an advanced level. Students are required to outline the problem, conduct the necessary literature survey and experimental work, and to present their observations and conclusions in a report. *(Independent Study)* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

951 Dietetics Seminar: Clinical Nutrition *(I and II, 1–2)* Discussion of current topics in clinical nutrition related to supervised experience. Limited to students enrolled in the Rhode Island AP4 Program. *(Seminar)* Greene

952 Dietetics Seminar: Community Nutrition *(I and II, 1–2)* Discussion of current topics in community nutrition related to supervised experience. Limited to students enrolled in the Rhode Island AP4 Program. *(Seminar)* Greene

953 Dietetics Seminar: Foodservice Management *(I and II, 1–2)* Discussion of current topics in foodservice management related to supervised experience. Limited to students enrolled in the Rhode Island AP4 Program. *(Seminar)* Greene

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French

M.A.
401-792-5911

Graduate Faculty

Chairperson: Professor John Grandin, Ph.D., 1970, University of Michigan
Director of Graduate Studies: Associate Professor Joseph G. Morello, Ph.D., 1968, University of Missouri
Professor Armand B. Chartier, Ph.D., 1970, University of Massachusetts, Amherst
Professor Kenneth H. Rogers, Ph.D., 1970, Columbia University
Professor H. Dorothy Rothschild, Ph.D., 1959, Columbia University
Associate Professor JoAnn Hammadou, Ph.D., 1988, Ohio State University
Associate Professor Ira A. Kuhn, Ph.D., 1970, University of Kansas
Associate Professor Constantin Toloudis, Ph.D., 1969, Rice University

Specializations

French studies that include French literature, French-Canadian literature, Black-French studies, linguistics.

Master of Arts

Admission requirements: 24 credits or equivalent of French, of which a minimum of nine must be in literature.

Program requirements: thesis—eight 500-level courses and a comprehensive examination; nonthesis—ten 500-level courses, including one course with a major paper requiring significant independent research, and comprehensive examination. A maximum of six credits from 400-level courses may be substituted for 500-level courses in the thesis or the nonthesis program.

FRN Courses
French

402 French Phonetics *(II, 3)*
411 Medieval Literature *(I, 3)*
433 Seventeenth-Century Literature *(II, 3)*
443 Eighteenth-Century Literature *(I, 3)*
453 Nineteenth-Century Literature Until 1848 *(I, 3)*
454 Nineteenth-Century Literature Since 1848 *(II, 3)*
461 Twentieth-Century Theatre *(I, 3)*
465 Twentieth-Century Prose *(I, 3)*
473 French-Canadian Literature *(I, 3)*
474 Black Literature in French *(I, 3)*
480 Business French *(I or II, 3)*
497, 498 Directed Study *(I and II, 3 each)*

501 Advanced Composition *(II, 3)* Stylistics to prepare undergraduate and graduate French majors to write expository French prose. *(Lec. 3) Pre: graduate status or permission of instructor. In alternate years.* Staff

503 History of the French Language *(II, 3)* Linguistic development of French from the earliest documents to the present. Gallo-Romance dialects; the spread of French in and beyond Europe. *(Lec. 3) Pre: graduate status or permission of instructor.* Rogers

Note: Courses 513–594 include lectures, discussions, readings, individual research, and a research paper.

513 Seminar in Medieval Literature *(I, 3) Pre: graduate standing or permission of instructor.* Staff

523 Seminar in Sixteenth-Century Literature *(I, 3) Pre: graduate standing or permission of instructor.* Rothschild

533 Seminar in Seventeenth-Century Literature *(I, 3) Pre: graduate standing or permission of instructor.* Morello

544 Seminar in Eighteenth-Century Literature *(II, 3) Pre: graduate standing or permission of instructor.* Rothschild

554, 555 Seminar in Nineteenth-Century Literature *(I and II, 3 each) Pre: graduate standing or permission of instructor.* Touloudis and Chartier

564 Seminar in Modern Poetry *(I, 3) Pre: graduate standing or permission of instructor.* Staff

565 Seminar in Twentieth-Century Theatre *(II, 3) Pre: graduate standing or permission of instructor.* Kuhn

566 Seminar in Twentieth-Century Prose *(I, 3) Pre: graduate standing or permission of instructor.* Touloudis

594 Special Topics *(I and II, 3)* Group and/or individual investigation of special problems in French language, literature, and civilization. *(Independent Study) Pre: acceptance of project by a staff member and permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Geology

M.S.
401-792-2265

Graduate Faculty

Chairperson: Professor O. Don Hermes, Ph.D., 1967, University of North Carolina
Director of Graduate Studies: Assistant Professor Anne I. Veeger, Ph.D., 1991, University of Arizona
Professor Jon C. Boothroyd, Ph.D., 1974, University of South Carolina
Professor and State Geologist J. Allan Cain, Ph.D., 1962, Northwestern University
Associate Professor David E. Fastovsky, Ph.D., 1986, University of Wisconsin
Associate Professor Reinhard K. Frohlich, Ph.D., 1966, University of Clausthal-Zellerfeld
Associate Professor Daniel P. Murray, Ph.D., 1976, Brown University

Specializations

Sedimentology: emphasis on field projects—a) measurement of Recent barrier, lagoonal and estuarine processes, and investigation of lithofacies; b) Recent braided rivers and alluvial fans; c) depositional systems of ancient rocks.

Stratigraphy—paleontology: paleoenvironmental reconstructions, historical geology, paleontology, paleobiology.

Coastal geomorphology: analysis of coastal land forms using field techniques, remote-sensing aerial and satellite imagery. Emphasis on Rhode Island barriers, Cape Cod, and barrier islands of the Atlantic coast.

Glacial geology: sedimentary aspects of Pleistocene and Recent glacial paleoenvironments of New England and Alaska; environmental mapping.

Hydrogeology: field and laboratory studies of groundwater flow, low-temperature geochemistry, and the interaction between groundwater and the geologic framework.

Applied geophysics: near-surface geophysics such as geoelectrics, gravity, and refraction seismic for groundwater and related topics. Gravity and magnetics related to structural and plutonic geology in southern New England.

Remote sensing: applied remote sensing using optical and computer analysis of satellite imagery and aerial photography in geomorphology and coastal, structural, planetary, and environmental geology.

Petrology—geochemistry: field and laboratory petrologic studies in the New England Appalachians, in the Sierra Nevada of California, and elsewhere, including petrogenesis of volcanic, plutonic, and metamorphic rocks.

Structure and tectonics: deformation at regional and microscopic scales; relationship between deformation and metamorphism; emphasis on New England tectonics.

Planetary geology: origin and history of chasms, channels, and valleys of Mars.

Resource and environmental studies: relevant aspects of the above specializations.

Individual programs may include courses and/or research in conjunction with the Graduate School of Oceanography and other departments; interdisciplinary studies are encouraged.

Master of Science

Admission requirements: GRE and bachelor's degree in science or engineering. By the end of the first year, students lacking an undergraduate major equivalent to the bachelor of science degree in geology will be required to demonstrate, through course work and/or qualifying examinations, comparable knowledge of geology and related fields.

Program requirements: thesis option—30 credits of course work; thesis and defense; an oral comprehensive examination; and a graduate seminar (for no program credit). Nonthesis option—36 credits of course work, not including a graduate seminar, with half or more credits at the 500 level or above and 18 or more credits in geology; GEL 592; advanced seminars in the relevant area(s) of specialization; an oral comprehensive examination; and a written comprehensive examination.

GEL Courses
Geology

401 Ore Deposits *(II, 3)*
421 Geochemistry *(I, 3)*
450 Introduction to Sedimentation and Stratigraphy *(I, 4)*
465 Introduction to Geophysics *(I, 3)*
468 Hydrogeochemistry *(I, 3)*
483 Hydrogeology *(I, 3)*
485 (or CVE 485) Engineering Geophysics *(II, 3)*
487 Quantitative Geology *(II, 3)*
488 Geological Evolution of North America *(II, 3)*

515 Glacial Geology *(I, 3)* Investigation of late Cenozoic glaciation including areas with presently existing glaciers. Primary stress on sedimentology and geomorphology of glacial deposits. Field trips in New England area. *(Lec. 2, Lab. 3) Pre: 450 or permission of instructor.* Boothroyd

530 Igneous Petrology *(II, 3)* Tectonic and chemical basis for igneous phenomena stressing the association concept of igneous activity. Evaluation of the criteria used in petrogenetic interpretations. *(Lec. 2, Lab. 3) Pre: 321 or permission of instructor. In alternate years. Next offered spring 1996.* Hermes

531 Metamorphic Petrology *(I, 3)* Facies concept and other methods of interpreting metamorphic mineral assemblages. Chemical and fabric changes during metamorphism, including principles of structural petrology. *(Lec. 2, Lab. 3) Pre: 321 or permission of instructor. In alternate years. Next offered fall 1995.* Murray

550 Sedimentary Processes *(II, 3)* Physical and chemical processes of sedimentation with emphasis on fluvial, beach, and estuarine environments. Stress on field applications of theory, with independent project and reading. *(Lec. 3) Pre: 450 or permission of instructor. Offered in spring of odd-numbered years.* Boothroyd

554 Sedimentary Petrology *(I, 3)* The detailed interpretation of siliciclastic and carbonate fabrics and textures in thin section and hand sample. Emphasizes aspects of diagenesis, including cementation, replacement, recrystallization, pedogenesis, and porosity evolution. Skeletal elements and paleoenvironmental context presented. *(Lec. 3) Pre: 240 and 450 or permission of instructor. In alternate years.* Fastovsky

565 Advanced Interpretation in Applied Geophysics *(II, 3)* Interpretation of geophysical data using theoretical models. Reflection, refraction, and surface propagation of seismic energy. Computer analysis of gravity and magnetic potential data. DC geoelectrical potential over horizontally stratified medium. *(Lec. 2, Lab. 2) Pre: MTH 243, PHY 214, or equivalent course in physics with permission of instructor. Offered in spring of odd-numbered years.* Frohlich

568 Isotopes in Hydrogeology *(II, 3)* Use of environmental isotopes in groundwater studies; dating groundwater, delineating flow paths and identifying recharge areas, geochemical evolution of groundwater and assessment of contamination. *(Lec. 3) Pre: 483 and 468 or permission of instructor. Offered in even-numbered years.* Veeger

570 Structural Analysis *(I, 3)* Mapping and geometric analysis of structures in variably deformed terrains. *(Lec. 3) Pre: 321, 370, 480, or permission of instructor. Offered in fall of even-numbered years.* Murray

577 Coastal Geologic Hazards *(II, 3)* Geologic hazards in the coastal zone and their impact on society. Includes waves, storm-surge, mass-wasting, and sea level rise. Geologic effectiveness of engineering structures and management techniques. Emphasis on field study. *(Lec. 2, Lab. 3) Pre: 450 or permission of instructor. Offered in spring of even-numbered years.* Boothroyd

580 New England Geology *(I, 3)* Review of the bedrock geology of New England, and its applications for the Appalachian/Caledonides mountain chain and theories of orogenesis. Mandatory field trips. *(Lec. 3) Pre: 321, 370, or permission of instructor. Offered in fall of odd-numbered years.* Murray

581 Topics in Tectonic Geology *(I, 3)* Review of selected topics in continental and oceanic tectonics. *(Sem. 3) Pre: permission of instructor. Offered in fall of even-numbered years.* Murray and Fox

583 Advanced Hydrogeology *(II, 3)* Advanced analysis of groundwater systems and the relationship between groundwater and geology. Principles and equations for groundwater flow in complex aquifers, groundwater modeling. Groundwater modeling project. *(Lec. 2, Lab. 3) Pre: 483 or 585 and MTH 244 or permission of instructor. Offered in odd-numbered years.* Veeger

590 Special Problems *(I and II, 1–3)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor.* Staff

591 Special Problems *(I and II, 1–3)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of instructor. S/U credit.* Staff

592 Nonthesis Master's Research *(I and II, 3)* Independent research for fulfillment of research requirement of nonthesis master's degree. Detailed report required. *(Independent Study) Pre: permission of chairperson. S/U credit.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Geology Topics for Teachers *(I and II, 0–3 each)* Especially designed for teachers of physical sciences. Basic topics of geology from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Staff

Note: For other related courses, see OCG 540, 625, 628, 629, 643, 644, 645, 646, 649, 651, 652, 678, 681 and CVE 581, 582, 585, 587, 588, 677, 681, 682, 687.

History

M.A.
401-792-2528

Graduate Faculty

Chairperson: Professor Josiah M. Briggs, Ph.D., 1962, Columbia University
Director of Graduate Studies: Professor James F. Findlay, Jr., Ph.D., 1961, Northwestern University
Professor Joel A. Cohen, Ph.D., 1967, University of Connecticut
Professor Frank Costigliola, Ph.D., 1973, Cornell University
Professor Robert M. Gutchen, Ph.D., 1966, Columbia University
Professor Chong Sun Kim, Ph.D., 1965, University of Washington
Professor Maurice N. Klein, Ph.D., 1965, Emory University
Professor Sharon H. Strom, Ph.D., 1969, Cornell University
Professor Gary Thurston, Ph.D., 1973, Columbia University
Professor Robert G. Weisbord, Ph.D., 1966, New York University Graduate School
Associate Professor Michael W. Honhart, Ph.D., 1972, Duke University
Assistant Professor Charles E. Daniel, Jr., Ph.D., 1968, Ohio State University
Assistant Professor Rosemarie Pegueros, Ph.D., 1993, University of California, Los Angeles
Adjunct Associate Professor Albert T. Klyberg, Ph.D., 1967, University of Michigan
Assistant Professor Emeritus Gino Silvestri, Ph.D., 1969, Syracuse University

Specializations

United States and Europe, with an emphasis on social, cultural, and political history. Students may complement their work in these fields with courses in Latin American or Asian history or with courses taken outside the department, particularly in political science, English, philosophy, and languages.

The master's program in history includes both class work and individual instruction in the form of 500-level seminars; small 400-level courses that include undergraduates; tutorials; and directed study courses, as well as master's thesis research for those who choose the thesis option. All graduate work stresses independent research and is designed to promote critical reading and writing. The diversified program—with its requirement for work in more than one field of history and the opportunity it offers of work in another discipline—should be of service both to students who wish to continue their graduate education at the doctoral level and to those who are interested in secondary teaching. Students are required to develop a systematic program of studies with the Director of Graduate Studies during their first semester as a master's degree candidate.

For tutorials (HIS 502, 503, 536, 537, 588, and 589), students participate in 300-level courses and complete additional projects assigned by the instructors. Tutorial arrangements are made with the instructor at the beginning of the semester. To be eligible, a graduate student must not have taken the 300-level course or one closely resembling it as an undergraduate. For a listing of 300-level courses, see the *Undergraduate Bulletin.*

Master of Arts

Admission requirements: GRE and bachelor's degree. While 24 credits of history are usually required, majors in related fields may be admitted with the permission of the Director of Graduate Studies and the department chairperson.

Program requirements: there are thesis and nonthesis options. In both options the student must declare a primary concentration in European or United States history, and a secondary concentration in another area of history or in a related field outside the department. An approved program will require 30 credits, including at least six credits from HIS 401, 441, or 481 and at least six credits from HIS 506, 507, and 508. Admission to the thesis option will be granted after evaluation, by the Director of Graduate Studies and two faculty members who serve on the thesis committee, of the student's first year of graduate work. In the nonthesis option, the student may earn no more than 12 credits in tutorials (502, 503, 536, 537, 588, and 589) and directed studies (591). Nine credits will normally be taken in the secondary concentration. A four-hour written comprehensive examination in the student's primary and secondary concentrations and a follow-up oral examination are required. The examining committee will normally consist of two faculty members from the student's primary concentration and one from the secondary concentration. In the thesis option, the student may earn a maximum of nine credits in thesis, tutorials, and directed studies. Work in the secondary concentration may be limited to six credits.

Cooperative Program (M.A. and M.L.I.S.)

By proper selection of course work, a student may simultaneously earn the degrees of Master of Arts in history and Master of Library and Information Studies.

Admission requirements: GRE (subject test desirable) and other requirements listed for history and library science. Applicant must apply and be accepted in both programs. The application for each program must indicate history/library and information studies as the field of specialization.

Program requirements: students must submit individual programs of study for each degree that satisfy specific core requirements for these programs. Since a maximum of six credits may be jointly used to satisfy degree requirements, a minimum of 66 credits total is required to satisfy the requirements for both degrees.

HIS Courses
History

401 Advanced Topics in European History *(I or II, 3)*

441 Advanced Topics in American History *(I or II, 3)*

481 Advanced Topics in Third World History *(I or II, 3)*

500 Colloquium in Selected Topics in History *(I or II, 3)* Intensive study of major interpretive works in various thematic, crossnational topics. *(Sem. 3) Pre: graduate or senior standing or permission of instructor.* Staff

502, 503 Special Readings in European History *(I and II, 3 each)* Intensive tutorial work, research, and readings in European history. *(Independent Study) Pre: graduate standing, permission of instructor, and concurrent audit of parallel 300-level course. May be repeated.* Staff

505 Seminar in Selected Topics in History *(I or II, 3)* Intensive research on selected thematic, cross-national topics. *(Sem. 3) Pre: graduate or senior standing or permission of instructor.* Staff

536, 537 Special Readings in American History *(I and II, 3 each)* Intensive tutorial work, research, and readings in American history. *(Independent Study) Pre: graduate standing, permission of instructor, and concurrent audit of parallel 300-level course. May be repeated.* Staff

544 Colloquium in Worker History
See Labor and Industrial Relations 544.

588, 589 Special Readings in Third World History *(I and II, 3 each)* Intensive tutorial work, research, and readings in Third World history. *(Independent Study) Pre: graduate standing and permission of instructor. Concurrent audit of parallel 300-level course required. May be repeated.* Staff

591 Directed Study or Research *(I and II, 3)* Directed readings, research, or study designed to meet the particular needs of individuals or small groups of graduate students. *(Independent Study)* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Human Development and Family Studies

M.S.
401-792-2150

Graduate Faculty

Chairperson: Associate Professor David A. Caruso, Ph.D., 1985, Cornell University
Director of Graduate Studies: Associate Professor Jerome A. Schaffran, Ph.D., 1971, University of Iowa

Human Development and Family Studies
Coordinator: Associate Professor Diane Horm-Wingerd, Ph.D., 1985, Virginia Polytechnic Institute
Professor Phillip G. Clark, 1979, Sc.D., Harvard University
Professor Stewart Cohen, Ph.D., 1967, Purdue University
Professor Gwenneth Rae, Ed.D., 1972, University of California
Associate Professor Joan Gray Anderson, Ph.D., 1984, University of California
Associate Professor David A. Caruso, Ph.D., 1985, Cornell University
Assistant Professor Mary Kalymun, Ph.D., 1982, University of Pennsylvania
Assistant Professor Karen A. Schroeder, Ph.D., 1977, University of Connecticut
Assistant Professor Jingjian Xiao, Ph.D., 1991, Oregon State University
Associate Professor Emerita Helen F. Greene, Ph.D., 1954, Florida State University

Marriage and Family Therapy
Coordinator: Professor Peter E. Maynard, Ph.D., 1969, State University of New York, Buffalo
Professor Gwenneth Rae, Ed.D., 1972, University of California
Associate Professor Jerome Adams, Ph.D., 1989, Purdue University
Associate Professor Jerome A. Schaffran, Ph.D., 1971, University of Iowa
Assistant Professor Karen A. Schroeder, Ph.D., 1977, University of Connecticut

College Student Personnel
Coordinator: Associate Professor Jerome A. Schaffran, Ph.D., 1971, University of Iowa
Professor Peter E. Maynard, Ph.D., 1969, State University of New York, Buffalo
Associate Professor Jayne Richmond, Ph.D., 1982, University of Florida
Assistant Professor Gerry Rolley, Ed.D., 1992, University of Rochester

Specializations

Human development and family studies; marriage and family therapy; counseling; college student personnel.

Human Development and Family Studies

Admission requirements: GRE or MAT, PSY 300 or STA 308 or equivalent, and 18 undergraduate credits distributed among at least three of the following areas: human development and family studies, psychology, sociology, biology, and education. Subspecializations are available in human development, early childhood education, family studies, and gerontology.

Program requirements: nine credits of core courses—HDF 500, 530, and 570; six credits of thesis or action research; nine credits of free electives (one course must be taken outside the department); and a comprehensive examination. An additional 12 credits must be taken from one of the following subspecialization areas: early childhood education—HDF 400, 406, 434, 455, 501, 502, and 503; child development—HDF 400, 406, 434, 502, 503, and 504; adult development/gerontology—HDF 420, 421, 431, 433, 440, 505, 520, 527, 535, and 559; family studies—HDF 430, 431, 433, 434, 505, 535, and 559. A total of 36 credits are required.

State Provisional Certification: persons wishing to meet state provisional certification requirements (Nursery to Grade 2) must apply for admission to teacher certification (nondegree status). Official transcripts of all previous course work plus two letters of recommendation are required. As a prerequisite to enrolling in courses that meet certification requirements, accepted applicants must complete or have completed the equivalent of an undergraduate degree in human development and family studies.

Marriage and Family Therapy

Admission requirements: GRE or MAT; at least 15 credits of relevant preparation courses, including family relations, developmental theory, personality theory, abnormal psychology, and introduction to counseling or an equivalent course; two letters of recommendation should be from supervisors in a related field attesting to observed experience, emotional stability, and maturity. After initial screening, qualified applicants will be required to come to campus for a personal interview. The goal of the personal interview is to determine whether the applicant possesses the full range of academic qualifications, experiential background, clinical competency, and readiness to undertake the rigors of an academically and emotionally demanding clinical preparation program. Several of the program's faculty members will conduct the interviews. Selec-

tion for admission to this program is highly competitive and enrollment is limited. Diversity among the students in the program is a major program goal. The program adheres to the standards established by the American Association for Marriage and Family Therapy (AAMFT). Completed application package must be received by March 1.

Program requirements: a minimum of 45 credits of approved graduate courses, including a 30-hour core and 15 credits of approved electives depending on previous training and background, and a comprehensive examination. This program involves intense clinical practice and a year-long internship at cooperating agencies or the department's Marriage and Family Therapy Clinic; therefore, full-time students are preferred.

College Student Personnel

Admission requirements: GRE or MAT and interview; preference given to applicants with experience in student affairs.

Program requirements: 27 credits in core HDF courses (HDF 450, 551, 554, 560, 562, 567, 568, 570, 590), six credits in adult development and social science electives, plus one of the following—a) nonthesis option with internship (HDF 580, 581, 583, 584, and a comprehensive examination); b) nonthesis option with action research project (HDF 595, six credits, one additional elective, and a comprehensive examination); or c) thesis option (HDF 599, six credits, and one additional elective).

HDF Courses
Human Development and Family Studies

400 Child Development: Advanced Course *(I and II, 3)*
406 Growth and Development During Infancy *(I or II, 3)*
420 Human Development During Adulthood *(I and II, 3)*
421 Death, Dying, and Bereavement *(I and II, 3)*
422 Aging: Case Coordination *(II, 3)*
424 Design and Delivery of Services for Mentally Retarded Adults *(II, 3)*
430 Family Interaction *(I and II, 3)*
431 Family and the Elderly *(I or II, 3)*
432 Perspectives on Parenting *(I or II, 3)*
433 Family Life Education *(I or II, 3)*
434 Children and Families in Poverty *(I or II, 3)*
437 (or SOC 437) Law and Families in the United States *(I or II, 3)*
440 Environmental Context of Aging *(I or II, 3)*
450 Introduction to Counseling *(I and II, 3)*
455 Assessment in Early Childhood *(II, 3)*
456 Assessment Practicum *(II, 3)*
497, 498 Special Problems *(I and II, 1–3 each)*

500 Human Development Seminar *(I or II, 3)* Contemporary research issues emerging in the human development literature at five stages of development (infancy, childhood, adolescence, adulthood, and old age), with emphasis placed on continuity and transition across the life span. *(Seminar) Pre: 400 or 420 or equivalent, or permission of instructor.* Cohen

501 Seminar in Early Childhood Education *(I or II, 3)* Seminar in trends and model programs in early childhood education. Special attention to substantive evaluation and program design issues for the professional early childhood educator. *(Seminar) Pre: student teaching or equivalent classroom experience or permission of instructor.* Staff

502 Cognitive Aspects of Early Childhood *(I or II, 3)* Impact of theory and research in cognitive development and its relation to language, learning, and thinking. Special attention to Piaget's impact on current research and educational programs. *(Seminar) Pre: 200, 201, or permission of instructor.* Staff

503 Social Development: Infancy Through Adolescence *(I or II, 3)* Seminar providing in-depth examination and critique of theory and research in social development. Implications for diverse populations and applications for human service settings will be drawn. *(Seminar) Offered in alternate years.* Horm-Wingerd or Cohen

504 Contemporary Theories of Ego Development *(I or II, 3)* Surveys of the recent theoretical constructs which synthesize the cognitive and psychosocial traditions into a developmental view of the ego. The relevance of the psychology of women to this synthesis is also considered. *(Seminar) Pre: graduate standing and permission of instructor. In alternate years.* Staff

505 Human Sexuality and Counseling *(I or II, 3)* Historical, cultural, and developmental issues in human sexuality and counseling. Implications for self and client understanding through personal exploration and desensitization to sensitive topics. *(Lec. 3) Pre: graduate standing or permission of instructor.* Rae or Staff

520 Developmental Issues in Later Life *(I or II, 3)* Theoretical and philosophical foundations for understanding the normal changes, pathological developments, clinical assessments, and intervention strategies associated with later life. *(Seminar) Pre: graduate standing.* Staff

527 Health Care Policy and the Elderly *(I or II, 3)* Present and future problems in policy development to meet health care needs of the elderly. Consideration of historical aspects, demographic change, policy models. *(Seminar) Pre: graduate standing.* Staff

529 Practicum Seminar in Gerontology *(I and II, 1)* A seminar focusing on adult development and aging. Designed for graduate students in gerontology to exchange results of original research or practical experiences through reports and discussions. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated for a maximum of 3 credits.* Staff

530 Family Theory Seminar *(I, 3)* Intensive study of theories in the family field, integrated with contemporary family issues, and family therapy. *(Seminar) Pre: 430 or permission of instructor.* Staff

535 Families Under Stress: Coping and Adaptation *(I, 3)* Theoretical models of family interaction, development, and stress as applied to understanding of family behavior in managing stress or events. Concepts of stress, vulnerability, adaptability, coping, regenerative power, social supports, and related research. *(Seminar) Pre: 430, 570, or equivalent graduate course work in family development or family sociology and permission of instructor.* Staff

550 Vocational Information and Career Development *(I or II, 3)* Classification and description of jobs and industries; study of occupational trends; needs of special groups entering the labor market; vocational development theories and counseling for long-range career planning. *(Lec. 3) Pre: 450 and graduate standing.* Staff

551 Counseling Theory and Techniques *(I or II, 3)* Theoretical foundation and practice of counseling and therapy in various settings. *(Lec. 3) Pre: 450 or permission of instructor.* Staff

553 Counseling Practicum *(I or II, 3)* Advanced counseling and therapy issues. Multiple sessions using tapes and critiques to assess growth and competence of the clinician. Limited enrollment. *(Practicum) Pre: 450, 551, advanced standing, and permission of instructor.* Staff

554 Individual Appraisal in Human Services *(II, 3)* Nature of the appraisal process and data essential to understanding the educational, vocational, and social needs of persons. Emphasis is on a team approach to counseling services and the utilization of case materials. *(Seminar) Pre: 551 and 570.* Staff

555 Gerontological Counseling *(I or II, 3)* An overview of the developmental process of later life, particularly relevant to counselors and therapists. Clinical counseling implications and therapeutic strategies will be emphasized. *(Lec. 3) Pre: 420, 450, or equivalent, and graduate standing. In alternate years.* Staff

559 Gender Issues in Therapy *(I or II, 3)* Systemic integration of the issues and therapeutic dilemmas growing out of society's changing views of women and men. Emphasis on research therapist self-awareness, and evaluation of current therapies. *(Seminar) Pre: 450 or equivalent and graduate standing or permission of instructor.* Rae

560 Group Procedures in Counseling *(I or II, 3)* Principles and techniques of group counseling and therapy as applied to education, counseling, and student personnel work. A practical and theoretical approach with emphasis on facilitation techniques, leadership patterns, and counseling skills. Enrollment is limited. *(Lec. 2, Lab. 4) Pre: 551 and permission of instructor.* Staff

562 Organization Development in Human Services *(I or II, 3)* Theory and technology of organization development as applied in human service agencies; entry diagnosis, implementation, and evaluation strategies, skills practice in consulting and training; evaluation and research of change efforts. *(Lec. 2, Lab. 4) Pre: 560.* Staff

563 Marital and Family Therapy I *(I, 3)* Major theoretical perspectives, including system theory as related to therapy. Communication and relationship skills, negotiation and behavioral contracting, treating specific relationship problems, therapy evaluation. *(Seminar) Pre: 430 and permission of instructor.* Staff

564 Marital and Family Therapy II *(II, 3)* Major contemporary theories of family therapy and the development of family therapy as a unique intervention strategy; special consideration of issues and problems commonly confronted in conducting family therapy. *(Seminar) Pre: 563.* Maynard

565 Family Therapy Practicum *(I, II, or SS, 3)* Supervised clinical experience in marriage and family therapy. Case materials will be presented by students, and taped segment of actual counseling sessions will be reviewed. *(Lec. 1, Lab. 5) Pre: admission to MFT program or permission of instructor. May be repeated for a maximum of 18 credits.* Staff

566 Theoretical and Clinical Problems *(II, 3)* Examination of major ongoing and emerging theoretical issues in family therapy. The implications of these problems in clinical practice with families. *(Lec. 3) Pre: 564 and graduate standing.* Staff

567 Principles and Practices of Student Personnel Services in Higher Education *(I, 3)* Survey of the historical, psychological, organizational, and educational factors which have evolved and combined to form student personnel work. *(Lec. 3) Pre: graduate standing and permission of instructor. In alternate years.* Staff

568 Organization and Administration of Student Personnel Services in Higher Education *(II, 3)* Systematic analysis of current practices in the alignment and operation of student personnel services, with continuing review of their interrelationships with the total educational program. *(Lec. 3) Pre: 567. In alternate years.* Staff

569 Assessment in Family Therapy *(I or II, 3)* Administration and interpretation of assessment instruments for treatment, planning, and evaluation. Ethical, legal, and theoretical issues related to family systems assessment are discussed. *(Seminar) Pre: graduate standing or permission of instructor.* Adams

570 Research in Human Development and Family Studies *(I and II, 3)* Historical, philosophical, and procedural foundations of scientific inquiries into individuals and families. Explores the various ways to acquire information about human development and family relationships. *(Lec. 3) Pre: graduate standing or permission of instructor.* Staff

580, 581 Professional Seminar in Counseling *(I and II, 3 each)* A two-semester sequence examining legal, ethical, and professional issues and standards related to counseling and therapy. Analysis of problems encountered in the internship experience. *(Seminar) Pre: concurrent enrollment in 583, 584, advanced standing, and permission of instructor.* Staff

583, 584 Master's Internship *(I and II, 3 or 6 each)* Supervised field practice in mental health or family agencies, schools, or colleges to integrate counseling and therapy theories and skills. *(Practicum) Pre: concurrent enrollment in 580 for 583, 581 for 584.* Staff

590 Higher Education Law *(I or II, 3)* An overview of federal and state legal systems' effect on university administration and service delivery. Reviews authorities and agencies, major court decisions, and the application of substantive and procedural law principles. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years.* Staff

595 Master's Project: Action Research *(I and II, 1–6)* Number of credits is determined each semester in consultation with the major professor. Minimum of 6 credits is required of students who have chosen the action-thesis option. *(Independent Study) S/U credit.*

597, 598 Advanced Study *(I and II, 1–3 each)* Survey of important research contributions significant to the understanding of human development and relationships. *(Independent Study)* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. The minimum of 6 credits is required of students who have chosen the thesis option. *(Independent Study) S/U credit.*

HSS Courses
Human Science and Services

491, 492 Special Problems *(I or II, 1–3 each)*

530 Multidisciplinary Health Seminars for the Elderly *(I or II, 3)* Field experience for students in various health disciplines. Development of assessment techniques, curricular materials, and team delivery of health seminars to the elderly at community sites. *(Sem. 3) Pre: graduate standing or permission of instructor.* Clark and Staff

590 Seminar in Human Science *(I or II, 3)* Investigation of human science as lived experience, reflective inquiry, and reflective practice. Development and presentation of individual projects embodying these characteristics of human science. *(Sem. 3)* Willis

Industrial and Manufacturing Engineering

See Manufacturing Engineering on page 69.

Labor and Industrial Relations

M.S.
401-792-2239

Graduate Faculty

Director, Labor Research Center: Professor Charles T. Schmidt, Jr., Ph.D., 1968, Michigan State University (Professor of Industrial Relations)
Professor Judith Anderson, Ph.D., 1970, Indiana University
Professor Charles P. Armstrong, Ph.D., 1973, University of Arizona
Professor Harold Barnett, Ph.D., 1973, Massachusetts Institute of Technology
Professor Winifred E. Brownell, Ph.D., 1973, State University of New York, Buffalo
Professor John P. Burkett, Ph.D., 1981, University of California, Berkeley
Professor Norman Coates, Ph.D., 1967, Cornell University
Professor Jerry Cohen, Ph.D., 1973, University of Illinois
Professor William Croasdale, Ed.D., 1966, Teachers College, Columbia University
Professor Albert J. Della Bitta, Ph.D., 1971, University of Massachusetts
Professor James F. Findlay, Jr., Ph.D., 1961, Northwestern University
Professor Timothy M. Hennessey, Ph.D., 1968, University of North Carolina
Professor Jeffrey E. Jarrett, Ph.D., 1967, New York University
Professor Andrew Laviano, J.D., 1965, New York University School of Law
Professor Bernice Lott, Ph.D., 1954, University of California, Los Angeles
Professor Craig E. Overton, Ph.D., 1971, University of Massachusetts
Professor John J. Poggie, Jr., Ph.D., 1968, University of Minnesota
Professor Yngve Ramstad, Ph.D., 1981, University of California, Berkeley
Professor Lawrence Rothstein, Ph.D., 1976, University of Massachusetts
Professor Richard W. Scholl, Ph.D., 1979, University of California, Irvine
Professor Beatrice Schultz, Ph.D., 1969, University of Michigan
Professor James L. Starkey, Ph.D., 1971, Boston College

and adult. *(Lec. 2, Lab. 3) Pre: 410, 430, second-year standing in physical therapy, or permission of instructor.* Robinson

542 Clinical Diagnosis *(I, 2)* Modern medical and therapeutic diagnostic methods are presented to develop competencies in referral and evaluation of disorders. Medical and pharmacological science topics pertaining to physical therapy diagnoses are presented by invited lecturers. *(Lec. 2) Pre: second-year standing in physical therapy or permission of instructor.* Rowinski

550 Orthopaedic Physical Therapy *(I, 3)* Physical evaluation and treatment techniques of the human muscular, articular, and skeletal systems related to orthopaedic conditions. Rehabilitation of injured, congenitally dysfunctioning, surgically intervened patients, and patients with conditions at risk for dysfunction. *(Lec. 2, Lab. 3) Pre: 410, 412, 420, 510; second-year standing in physical therapy or permission of instructor.* Blanpied

552 Functional Rehabilitation and Advanced Therapeutic Exercise *(II, 3)* Patient care techniques and programs related to the restoration of functional motor activities are provided through specification of treatment protocols, assistive devices, therapeutic apparatus, and therapeutic exercise programs. Competency is developed by simulating actual clinical conditions. *(Lec. 2, Lab. 3) Pre: 550 or permission of instructor.* Blanpied and Agostinucci

555 Seminar in Physical Therapy *(I, II, or SS, 1–3)* Group exploration of advanced topics in physical therapy through study of recent literature and investigations. Detailed research reviews, clinical cases, and reports are brought to discussion. May be repeated with different topic for a maximum of 6 credits. *(Seminar) Pre: graduate standing and permission of instructor or director.* Staff

560 Neurological Physical Therapy *(II, 3)* Physical therapy for the neurologically disabled patient. Proprioceptive neuromuscular facilitation, neurodevelopmental, sensory-motor integration, other patterned stimulation and evaluation techniques with emphasis on stroke, spinal cord injury, and other disabling conditions of the nervous system. *(Lec. 2, Lab. 3) Pre: 430, ZOO 242, second-year standing in physical therapy, or permission of instructor.* Robinson

570 Cardiopulmonary Physical Therapy *(II, 3)* Physiological basis, testing and evaluation, treatment, and administration of programs for cardiac and pulmonary-diseased patients requiring physical therapy. *(Lec. 2, Lab. 3) Pre: 420, 422, second-year standing in physical therapy, or permission of instructor.* Robinson

574 Sports Physical Therapy *(II, 2)* Advanced knowledge and competency in sports injury evaluation and treatment are developed. Additional coverage of sports injury prevention, athletic screening, medical intervention, interdisciplinary coordination, and patient or public education is provided. *(Lec. 1, Lab. 3) Pre: 550 or permission of instructor.* Blanpied

575 Physical Therapy Internship I *(SS, 5)* Assignment to various clinical settings which provide supervised experiences with practicing physical therapists and support personnel. Specific setting and rotational time schedule is determined by the academic clinical coordinator and clinical staff. *(Practicum) Pre: permission of instructor.* Staff

580 Pediatric and Geriatric Physical Therapy *(I, 3)* Specific problems of the maturing and aging patient population in physical therapy practice. Developmental disability programs and treatment programs in nursing facilities, treatment centers, and home programs for the aged patient population. *(Lec. 2, Lab. 3) Pre: 430, 540, third-year standing in physical therapy.* Robinson

585 Physical Therapy Internship II *(II, 5)* Assignment to various clinical settings which provide supervised experiences with practicing physical therapists and support personnel. Specific setting and rotational time schedule is determined by the academic clinical coordinator and clinical staff. *(Practicum) Pre: permission of instructor.* Staff

590 General Practice Physical Therapy *(I, 3)* Problems and benefits associated with the business and conduct of different types of physical therapy private practice. Integration of the art and science of physical therapy with the delivery of services. *(Lec. 3) Pre: 418, 528, third-year standing in physical therapy.* Staff

595 Physical Therapy Internship III *(II, 5)* Assignment to various clinical settings which provide supervised experiences with practicing physical therapists and support personnel. Selection of clinical specialty area of student's interest is considered in determination of the setting. *(Practicum) Pre: permission of instructor.* Staff

Physics

M.S., Ph.D.
401-792-2633

Graduate Faculty

Chairperson: Professor Surendra S. Malik, Ph.D., 1960, Agra University
Professor Jill C. Bonner, D.Sc, 1984, King's College, University of London
Professor J. Scott Desjardins, Ph.D., 1959, Columbia University
Professor Kenneth L. Hartt, Ph.D., 1963, University of Nebraska
Professor Leonard M. Kahn, Ph.D., 1976, Brown University
Professor Charles Kaufman, Ph.D., 1963, Pennsylvania State University
Professor Stephen V. Letcher, Ph.D., 1964, Brown University
Professor Alexander E. Meyerovich, D.Sc., 1985, Institute of Physical Problems, Moscow
Professor Gerhard Muller, Ph.D., 1980, University of Basel
Professor M. Peter Nightingale, Ph.D., 1978, University of Amsterdam
Professor Jan A. Northby, Ph.D., 1966, University of Minnesota
Professor Anthony C. Nunes, Ph.D., 1969, Massachusetts Institute of Technology
Professor Stanley J. Pickart, Ph.D., 1958, University of Maryland
Professor Albert Steyerl, Ph.D., 1971, Technische Universitat, Munich
Associate Professor David R. Heskett, Ph.D., 1985, University of Pennsylvania
Adjunct Professor Frank W. Cuomo, M.S., 1961, University of Rhode Island
Adjunct Professor Louis Goodman, Ph.D., 1971, Drexel University
Adjunct Professor Richard A. McCorkle, Ph.D., 1970, North Carolina State University
Adjunct Assistant Professor Elizabeth Bozyan, Ph.D., 1985, University of Texas, Austin

Specializations

Acoustics and optics: underwater acoustics; acoustic imaging; ultrasonics; acousto-optical transducers; fiber optics.

Astronomy: astrometry; differential photometry.

Condensed matter theory: low-dimensional physics; statistical mechanics; magnetism; surface magnetism; Fermi liquids, spin-polarized helium and hydrogen, nonlocal hydrodynamics; chemisorption; superconductivity; alloys; hydrogen in metals; defects in solids.

Interdisciplinary physics: computational physics; biophysics; magnetochemistry; dissipative chaos applied to marine and climate phenomena.

Liquid state: liquid crystals; liquid helium; ferrofluids; turbulence; superfluids.

Low-temperature physics: ionic mobilities; finite droplet effects; magnetic susceptibility; specific heats; magnetic cooling; quantum solids, liquids, and gases.

Neutron physics: ultra-cold neutrons; neutron optics.

Neutron scattering: small-angle scattering; solution scattering; surfaces and fine particles; crystal structure; amorphous magnets; high-temperature superconductors; inelastic scattering; phonons and spin waves.

Nuclear theory: inverse scattering studies; few-nucleon studies; hypernuclei; weak interactions.

Surface physics: electronic and structural properties of surfaces including phase transitions using LEEDS, AUGER, X-rays, and BNL Synchrotron Facility.

Specializations

Research activities are focused on tissue biomechanics, neuromuscular control, muscle performance, and neurological rehabilitation. Clinical therapeutic skill is enhanced by faculty clinical practice and regional internships.

Master of Science

Admission requirements: GRE (aptitude test scores at the 50th percentile or above are desired) and a bachelor's degree with 12 credits of biological sciences (including a minimum of six credits of human anatomy and human physiology); physical sciences (preferably 16 credits, eight in chemistry and eight in physics); six credits of social sciences (including general and developmental psychology); three credits in mathematics (preferably precalculus); and three credits in communications (preferably writing or speech). Courses in abnormal psychology, computer science, exercise physiology, and statistics through ANOVA are strongly recommended but not required.

A clinical experience with a physical therapist is required. The experience should include observing and aiding a physical therapist in treatment or evaluation procedures. The minimum number of hours recommended for the clinical experience is 30–40 hours of voluntary or paid time. Most successful applicants demonstrate a diversity of clinical experience and a number of hours exceeding the minimum required in a physical therapy setting. The experience may be part of field work study for credit in a health-related discipline. Evidence of such experience should be documented by a recommendation from the physical therapist addressing the nature and duration of the experience, which should be submitted as part of the application process. Special recommendation forms and a form for the listing of completed prerequisites should be obtained by sending a self-addressed, stamped envelope to the physical therapy program. Baccalaureate requirements must be completed prior to final acceptance into the master's program. The completed application package must be received by January 15. While applications will be reviewed as early as December 15, applicants will be admitted for September only.

Program requirements: A minimum of 83 credits of specified physical therapy course work, including 15 credits of internship. This program is a three-year plan of required course work, with the first two semesters at the 400 and 500 levels (29 credits), followed by four semesters and a summer session of graduate-level course work, including an internship at an affiliated institution between the second and third year. As for all internships, the student may have to pay living expenses for summer internships. Internships also require immunization for the hepatitis B virus and instruction in HIV precautions, as required by OSHA standards. Immunization is at the student's expense. Though essentially a nonthesis program, a substantial paper involving significant independent research is required. A course in statistical methods, which includes ANOVA, correlation, and regression analysis, is required prior to or concurrent with the first semester of the second year of the program. All course work involving clinical skill development requires skill competency testing via practical examination. All clinical competencies determined necessary by the faculty of the respective course must be demonstrated as adequately learned by the student in these courses for achievement of an adequate scholastic course grade. (See "Scholastic Standing," page 16.) Master's comprehensive examination is required. Courses required during the first two semesters may be waived, with an equivalent reduction in credits required for the degree, if acceptable grades have been earned in the course(s) prior to final acceptance into graduate status, and if approved by the program faculty.

PHT Courses
Physical Therapy

410 Human Anatomy and Histology *(I, 5)*
412 Basic Physical Evaluation, Therapeutic Exercise, and Care *(I, 3)*
413 Applied Anatomy *(I, 1)*
417 Psychosocial Needs of the Disabled *(I, 2)*
418 Professional and Community Practices in Physical Therapy *(I and II, 1)*
420 Physiological Basis of Physical Therapy *(I, 3)*
422 Pathophysiology and Medical Management of Movement Disorders *(II, 3)*
430 Human Neurosciences and Neurology *(II, 4)*

510 Biomechanics and Pathokinesiology *(II, 3)* Principles, theories, and recent investigations of the biomechanics of human motion and posture are presented to develop analytical skills for normal and abnormal movement evaluation. *(Lec. 2, Lab. 3) Pre: 410, 412, 420, or permission of instructor.* Blanpied

513 Directed Study in Physical Therapy *(I, II, and SS, 1–3)* Subject matter arranged to meet the individual needs of graduate students in physical therapy under the supervision of staff. *(Independent Study) Pre: permission of instructor.* Staff

515 Research Methods in Physical Therapy *(I, 3)* Research design and methods in current physical therapy theory development and scientific literature. Preparation of a research proposal through review of literature and pilot study of selected research methods are required. *(Lec. 3) Pre: credit or concurrent enrollment in STA 307 or equivalent and second-year standing in physical therapy or permission of instructor.* Rowinski and Blanpied

518 Ethical, Legal, and Interdisciplinary Issues of Clinical Practice *(I, 2)* Standards, ethical considerations, and legal implications of physical therapy practice. Communication with other health care disciplines and governmental agencies for the provision, progression, and implementation of physical therapy services. *(Lec. 2) Pre: second-year standing in physical therapy or permission of instructor.* Roush

525 Research Projects in Physical Therapy I *(I, 3)* Development of an investigation into some problem of basic or applied physical therapy science. Case studies, preliminary data, or survey instruments are compiled, and a review of related literature is accomplished under guidance of faculty. *(Independent Study) Pre: 515, third-year standing in physical therapy, or permission of instructor.* Staff

528 Professional Practice and Administration *(II, 3)* Responsibilities of the physical therapist in supervising personnel and establishing therapeutic practice in hospital, out-patient, and private settings. Department planning, personnel development, cost accounting and billing, standards of practice, and quality assurance are discussed. *(Lec. 3) Pre: second-year standing in physical therapy or permission of instructor.* Roush

532 Physical Agents and Instrumentation in Physical Therapy *(II, 4)* Theory, clinical investigations, and current research regarding the application of physical therapeutic energies and agents. Direct treatment techniques and supervision of support personnel in the administration of mechano-, electro-, thermo-, hydro-, ionto-, and phototherapy. *(Lec. 3, Lab. 3) Pre: 420, second-semester standing in physical therapy or permission of instructor.* Rowinski

535 Research Project in Physical Therapy II *(II, 3)* Completion of investigation into some problem of basic or applied physical therapy science. Data gathering is completed, results are summarized, and conclusions relating findings to previous studies are formulated. *(Independent Study) Pre: 525 or permission of instructor.* Staff

538 Professional Problems and Public Relations *(I, 2)* Current problems in professional practice including legislative, educational, and interdisciplinary topics. Issues relating to consumers of physical therapy services and methods of marketing the services of physical therapists are elaborated. *(Lec. 2) Pre: third-year standing in physical therapy or permission of instructor.* Staff

540 Human Motor Development and Learning *(I, 3)* Development and maturation of the human nervous system forms the basis for clinical considerations of developmental disabilities and motor learning. Theories of motor skill acquisition and therapeutic interventions for neuromuscular problems of the infant, child, adolescent,

540 (RCR 485) Planning and Supervision of Recreational and Athletic Facilities *(I, 3)* Examination of the factors involved in the construction and/or renovation of facilities for most efficient multipurpose use and maintenance. Course includes field trips. *(Lec. 3) Pre: junior standing and permission of chairperson.* O'Leary

550 Administration of Physical Education *(I or II, 3)* Problems and procedures for administering a physical education program studied from the viewpoint of the physical education administrator, the school administrator, and the faculty. Emphasis is placed on the study of administrative cases. *(Lec. 3) Pre: 380 or permission of instructor.* Nedwidek, Polidoro, or Crooker

551 Sport and Recreation Operations *(I or II, 3)* Analysis of operational problems and policies associated with interscholastic, intercollegiate, professional, community, and commercial sports enterprises. *(Lec. 3) Pre: 380 or graduate standing.* Nedwidek and Crooker

552 Supervision of Physical Education and Health Instruction *(I or II, 3)* Principles, techniques, and procedures involved in effective supervision of physical education and health instruction, with emphasis on the leadership role of the supervisor in the improvement of instruction. *Pre: graduate standing or permission of instructor. (Lec. 3)* Nedwidek

559 Principles of Exercise Testing and Interpretation *(I or II, 3)* Theory and practical application of exercise testing and interpretation. Includes information on testing of athletes as well as clinical testing and interpretation. *(Lec. 3) Pre: ZOO 343 or permission of instructor.* Manfredi or Staff

560 (or HLT 560) Seminar in Health, Physical Education, and Recreation *(I or II, 3)* Selected topics within the three areas, depending on availability of specialized instruction including visiting professorship. *(Seminar) Pre: permission of instructor.* Staff

562 Advanced Exercise Physiology *(I or II, 3)* Advanced study of the physiological factors limiting physical performance and work capacity with emphasis on the effects of physical conditioning on health and fitness. *(Lec. 3) Pre: ZOO 343 or permission of instructor.* Manfredi

563 Fitness Programs for the Middle-Aged and Elderly *(I or II, 3)* Provides the professional physical educator with an in-depth knowledge of scientific principles applicable to the administration of adult physical fitness programs. Client characteristics, screening, program supervision, liability, recruitment, and adherence. *(Lec. 3) Pre: graduate standing or permission of instructor.* Staff

564 Physiology of Aging *(I or II, 3)* Library searches, reports, and discussion of topics of current research on the physiology of aging. Subject matter adapted to meet interests of staff and students. *(Lec. 3) Pre: ZOO 242 or permission of instructor.* Manfredi

565 Cardiovascular Rehabilitation *(I or II, 3)* Focus on cardiac rehabilitation, underlying pathology and pathophysiology, diagnostic and prognostic testing, and principles of rehabilitation. Special emphasis on exercise intervention and lifestyle change. *(Lec. 3) Pre: ZOO 343 or permission of instructor.* Manfredi or Staff

575 Principles of Motor Learning *(I or II, 3)* Study of processes and conditions involved in the learning of motor skills. Includes contemporary models of skill learning with emphasis on developmental, environmental, and individual factors that influence skill acquisition. *(Lec. 3) Pre: EDC 312 or equivalent and graduate standing.* Staff

578 Sport in American Culture *(I or II, 3)* A survey of contemporary themes relating to the study of human behavior in sports contexts in American culture. *(Lec. 3) Pre: graduate standing or permission of instructor.* Cohen

580 Physical Education: Mentally Retarded and Learning Disabled *(I or II, 3)* Contributions of physical education to the growth and development of the mentally retarded and learning disabled. Theoretical and practical aspects of programs to best serve their individual needs. *(Lec. 3) Pre: permission of instructor.* Bloomquist

581 (or PSY 581) Psychological Aspects of a Healthy Lifestyle *(I or II, 3)* Psychosocial variables involved in health maintenance and recovery from disease with emphasis on compliance in exercise. A review of models and research identifies client needs and counseling methods. *(Lec. 3) Pre: graduate standing, PSY 113 and 232, or permission of instructor.* Sonstroem

582 Sport Psychology *(I or II, 3)* Counseling and psychotherapeutic techniques to improve athletic performance. Considers needs of the athlete arising from competitive stress, staleness, failure, team structure, and interactions. *(Lec. 3) Pre: graduate standing, PSY 113 and 232, or permission of instructor.* Sonstroem

585 Adapted Physical Activities for Special Populations *(I, 3)* Characteristics and needs for special populations: retarded, emotionally disturbed, learning disabled, sensory impaired, and obese. Adapted activities based on individual needs. Effects of federal legislation on programs discussed. *(Lec. 3) Pre: permission of instructor.* Bloomquist

591 (or HLT 591) Special Problems *(I or II, 3)* Written paper reporting an in-depth investigation of a pertinent problem in the field, including a review of relevant literature, analysis, and solution of the problem based on scientific methodology, with recommendations for improved practices. *(Independent Study) Limited to and required of all graduate students in physical education who elect the nonthesis option.* Staff

592 (or HLT 592) Internship in Physical Education *(I, II, or SS, 3)* Directed field experience under the supervision of a faculty member and a professional staff member of the cooperating institution. Application of knowledge, synthesis of practical experiences. Paper required. *(Practicum) Pre: a minimum of 12 graduate credits in physical education and permission of major professor and chairperson.* Staff

595 (or HLT 595) Independent Study *(I or II, 3)* Development of an approved project supervised by a member of the graduate faculty. *(Independent Study) Pre: permission of chairperson and instructor. May not be substituted for 591 or 599.* Staff

599 (or HLT 599) Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.* Staff

HLT Courses
Health

457 (or CNS 457) Health and Safety Issues of Consumer Products *(I or II, 3)*

459 Birth Defects: Family and Community Health Perspectives *(SS, 3)*

560 Seminar in Health, Physical Education, and Recreation
See Physical Education 560.

591 Special Problems
See Physical Education 591.

592 Internship
See Physical Education 592.

595 Independent Study
See Physical Education 595.

599 Master's Thesis Research
See Physical Education 599.

Physical Therapy

M.S.
401-792-5001

Director: Associate Professor Mark J. Rowinski, Ph.D., 1976, Medical College of Georgia
Assistant Professor James Agostinucci, D.Sci., 1988, Boston University
Assistant Professor Peter R. Blanpied, Ph.D., 1989, University of Iowa
Assistant Professor Deirdre E. Robinson, M.S., 1989, Northeastern University
Assistant Professor Susan E. Roush, Ph.D., 1990, University of Washington
Clinical Assistant Professor Vicki L. Winter, M.S., 1988, University of Connecticut

The physical therapy program is an entry-level Master of Science program that prepares students for the state professional licensure examination. There is an emphasis on the development of clinical skill and research capability through the three-year graduate study plan.

452 Philosophy of Science *(I or II, 3)*
453 Philosophy of the Social Sciences *(II, 3)*

502, 503 Tutorial in Philosophy *(I and II, 3 each)* Discussion by the staff and advanced students of research problems in philosophy. Presentation and criticism of original papers. *(Independent Study) Pre: graduate standing or permission of instructor. May be repeated for a maximum of 9 credits.* Staff

513 General Axiology *(I or II, 3)* Intensive historical and systematic study of issues such as the nature and kinds of values, their ontological status, their relation to culture, their relation to emotions, relation of axiology to other disciplines. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Wenisch or Staff

530 Philosophy of Plato *(I or II, 3)* Selected dialogues from the later period. Particular attention will be given to the areas of metaphysics, epistemology, cosmology, and ethics. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Zeyl

531 Philosophy of Aristotle *(I or II, 3)* Selected texts with emphasis on the major concepts of Aristotle's metaphysics, theory of knowledge, and ethics. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Zeyl

542 Advanced Studies in Patristic and Scholastic Philosophy *(I or II, 3)* Intensive studies of one or more thinkers belonging to the patristic or scholastic tradition. The specific subject may change from year to year. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Peterson or Roberts

551 Philosophical Logic *(I or II, 3)* Intensive consideration of such issues as the nature, structure, and function of propositions, predication, analysis of the "is" relation. Relation between proposition and facts. Nature of logic and criterion of the logical, relation of logic to language, psychology, and ontology. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Kowalski or Staff

555 Philosophy of the Arts and of Literature *(I or II, 3)* An intensive study of one or more thinkers concerned with philosophical problems arising from our experience of the arts and of literature. The phenomenological tradition will be stressed. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Foster or Staff

570 Philosophy of Immanuel Kant *(I or II, 3)* Intensive analysis of major texts. Special attention will be given to *The Critique of Pure Reason. (Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Peterson or Staff

580 Nineteenth-Century Philosophy *(I or II, 3)* Intensive analysis of the work of a major philosopher or philosophical movement. Attention will be given to such major figures as Hegel, Kierkegaard, C.S. Peirce, or James. The specific subject changes from year to year. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Foster, Johnson, or Staff

582 Advanced Studies in Contemporary Philosophy *(I or II, 3)* Intensive studies of one or more thinkers of philosophical movements of the twentieth century. The specific subject may change from year to year. *(Seminar) Pre: graduate standing or permission of instructor. In alternate years.* Johnson or Staff

599 Master's Thesis Research *(I and II)* Number or credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Physical Education

M.S.
401-792-2976

Graduate Faculty

Director of Graduate Studies: Associate Professor John O'Leary, M.S., 1963, Southern Connecticut State College
Professor Lorraine C. Bloomquist, Ed.D., 1974, Boston University
Professor Greta L. Cohen, Ed.D., 1981, Boston University
Professor Thomas Manfredi, Ph.D., 1976, University of Massachusetts
Professor Raymond A. Nedwidek, Ed.D., 1965, University of Pittsburgh
Professor Robert J. Sonstroem, Ph.D., 1968, University of Minnesota
Associate Professor Jeannette E. Crooker, M.S., 1959, University of Rhode Island
Associate Professor Leo E. O'Donnell, Ed.D., 1970, Temple University
Associate Professor J. Richard Polidoro, D.P.E., 1969, Springfield College
Associate Professor Mark J. Rowinski, Ph.D., 1976, Medical College of Georgia
Associate Professor Diane Seleen, Ed.D., 1981, Boston University
Assistant Professor Linda S. Lamont, Ph.D., 1983, Kent State University

Specializations

Physical education, teacher education and administration, exercise science, adapted physical education, psychological aspects of sport and health, and international sport and physical education.

Master of Science

Admission requirements: MAT or GRE with B.S. degree in physical education, health and physical education, or health education. In exceptional cases, a candidate without a major in physical education or a related area but with a strong emphasis in physical education is accepted.

Program requirements: thesis—30 credits, including PED 530, 531, 599, and six credits from physical education courses outside the area of specialization. Nonthesis option—33 credits, including PED 530, 531, 591, and six credits from physical education courses outside the area of specialization; a written master's comprehensive examination. In addition to the program requirements, all students choosing the international sport and physical education specialization must select 12 credits from PED 526, 592, and REN 595 or PSC 431. Students choosing the nonthesis option in this specialization must select an additional six credits from PED 560, RCR 485, and REN 595 or PSC 431.

PED Courses
Physical Education

410 Corrective and Adapted Physical Education *(I and II, 3)*
416 (RCR) Aging and Leisure *(I or II, 3)*
430 Adapted Aquatics *(I, 3)*
450 Theoretical Aspects of Track and Field Athletics *(II, 3)*
480 Application of Biomechanics to Coaching Athletics *(I or II, 3)*

510 Current Issues in Physical Education, Health, and Recreation *(I or II, 3)* Designed to develop student awareness of contemporary situations that are of concern to the above professions. Extensive review of contemporary literature. Critical analysis of selected issues, their components, and effects. *(Lec. 3) Pre: permission of instructor.* Polidoro

520 Curriculum Construction in Physical Education *(I or II, 3)* Analysis of criteria and procedures for curriculum construction in physical education. Standards for the evaluation and revision of elementary and secondary school physical education courses. *(Lec. 3) Pre: permission of instructor.* Crooker

525 Comparative Physical Education and Sport *(I or II, 3)* Examination of the status and practice of sport and physical education in selected countries. Emphasis on comparative analyses in developed and third world countries. *(Lec. 3) Pre: graduate standing or permission of instructor.* Polidoro

526 Sport and International Relations *(I or II, 3)* An examination of the role that sport plays in promoting international relations. Special lectures, readings, library research on topics relating to sport and international relations. *(Lec. 3) Pre: graduate standing or permission of instructor.* Polidoro

530 Research Methods and Design in Health and Physical Education *(I or II, 3)* Introduction to methodology in experimental, laboratory, curriculum, action, and historical research. *(Lec. 3) Pre: competence in basic statistics and permission of instructor.* Sonstroem and O'Donnell

531 Advanced Experimental Techniques in Physical Education *(II, 3)* In-depth analysis of research studies in the field. Advanced research technique studied and applied to problems in physical education. *(Lec. 3) Pre: 530 or permission of instructor.* Sonstroem

570 Case Studies in Pharmacy Law *(II, 3)* Case studies and a detailed analysis of the FDC, Controlled Substances Act, and health insurance laws. *(Lec. 3) Pre: 351. In alternate years.* Campbell

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

621, 622 Seminar *(I and II, 1 each)* Seminar discussions and presentation of papers on selected topics in pharmacy administration. *(Seminar) Required of all graduate students, with a maximum of 1 credit allowed per year. May be repeated for a maximum of 3 credits.* Staff

651, 652 Health Care Systems I, II *(I and II, 3 each)* Arrangements for utilizing pharmaceutical resources in public and private systems of health care in the United States and other countries. Variations in quality and distribution of care among socioeconomic groups. *(Lec. 3) Pre: 480 and STA 308 or 409, or equivalent.* Taubman and Campbell

680 Legal Environment in Health Administration *(I, 3)* Application of specialized statutory and regulatory provisions in federal and state law to the delivery of health care. *(Lec. 3) Pre: graduate standing.* Campbell

697, 698 Research in Pharmacy Administration *(I and II, 1–3 each)* Literature survey, laboratory work, and a detailed research report on one or more assigned topics in pharmacy administration. *(Independent Study)* Staff

Doctor of Pharmacy

Pharm.D.
401-792-2789

A revised program for the Doctor of Pharmacy, as first professional degree, will be implemented starting in the 1994–95 academic year. Individuals seeking information regarding the revised program should call 401-792-7100 or 401-792-5888.

PHP Pharmacy Practice Courses for Doctor of Pharmacy Program

511, 512 Advanced Pharmacotherapeutics *(I and II, 3 each)* The clinical use of medications in a disease-oriented approach. The basic concepts of pharmacology, pharmacy, pathophysiology, and biochemistry will be correlated to the treatment of disease. *(Lec. 3) Pre: fifth-year standing in the Doctor of Pharmacy program or permission of instructor. Must be taken concurrently with 561, 562.* Staff

530 Behavioral Skills in Clinical Pharmacy *(SS, 3)* Communication skills, behavioral aspects of illness, and the social and ethical considerations of clinical pharmacy. *(Lec. 3) Pre: enrollment in Doctor of Pharmacy program or permission of chairperson.* Larrat

542 Drug-Induced Diseases *(I, 2)* An overview of diseases induced or aggravated by drug therapy. The course is organized using an organ system/disease-state approach. *(Lec. 2) Pre: enrollment in Doctor of Pharmacy program or 451 and 452.* Owens

544 Physical Assessment *(II, 1)* Organ system approach to components of physical examination and evaluation. Emphasis is placed on understanding those physical signs and symptoms which may be drug-induced. Practice skills are introduced. *(Lec. 3) Pre: enrollment in the Doctor of Pharmacy program or permission of instructor.* Geletko

561, 562 Advanced Human Pathophysiology *(I and II, 4 each)* The etiology, epidemiology, pathology, and clinical laboratory manifestation of diseases occurring in man. This intensive course will be taught in a biomedical format. *(Lec. 4) Pre: fifth-year standing in the Doctor of Pharmacy program or permission of instructor.* Owens and Staff

581, 582 Clinical Pharmacy Seminar *(I and II, 1 each)* Presentations made by students on appropriate advanced clinical pharmacy topics. *(Seminar) Pre: fifth- or sixth-year standing in the Doctor of Pharmacy program or permission of instructor.* Dudley and Staff

590 Advanced Clinical Pharmacy Clerkship *(I and II, 5)* Through direct clinical contact, students will learn how to provide optimal pharmacotherapy for patients. This will be accomplished by collecting and interpreting data to design, recommend, implement, and modify patient-specific pharmacotherapy in collaboration with other health professionals. (Five credits taken five times for a total of 25 credits.) *(Practicum) Pre: sixth-year standing in the Doctor of Pharmacy program or permission of instructor. First offered fall 1995.* Owens and Staff

681, 682 Clinical Pharmacy Seminar I, II *(I, 1 each)* Presentation made by students on appropriate advanced clinical pharmacy topics. *(Seminar) Pre: enrollment in the Doctor of Pharmacy program. Last offered 1994–95.* Dudley

690 Advanced Clinical Pharmacy Clerkship and Research *(I, II, and SS, 2–9)* Application and development of advanced clinical skills and knowledge, communication techniques, and clinical research. Skills refined by functioning as a clinical pharmacist in a clinical practice site under the supervision of a faculty member. *(Practicum) Pre: enrollment in the Doctor of Pharmacy program. Last offered 1994–95.* Owens

Philosophy

M.A.
401-792-2418

Graduate Faculty

Chairperson: Professor Galen A. Johnson, Ph.D., 1977, Boston University
Professor Yong Choon Kim, Ph.D., 1969, Temple University
Professor John F. Peterson, Jr., Ph.D., 1965, Indiana University
Professor Stephen D. Schwarz, Ph.D., 1966, Harvard University
Professor Fritz Wenisch, Ph.D., 1968, University of Salzburg
Professor Donald J. Zeyl, Ph.D., 1972, Harvard University
Associate Professor James G. Kowalski, Ph.D., 1975, University of Notre Dame
Associate Professor Lynn Pasquerella, Ph.D., 1985, Brown University
Assistant Professor Cheryl A. Foster, Ph.D., 1992, University of Edinburgh
Assistant Professor Mark Roberts, Ph.D., 1987, University of Dallas
Professor Emeritus John W. Hanke, Ph.D., 1967, Indiana University
Professor Emeritus William Young, B.Litt., 1958, University of Oxford

Specializations

Programs of study are offered in the following general areas: logic and philosophy of science, axiology, and history of philosophy.

Master of Arts

Admission requirements: GRE and 18 credits in basic philosophy courses. Students whose undergraduate preparation did not include at least 18 credits in basic philosophy courses will be required to take these in addition to the graduate program requirements.

Program requirements: thesis option—24 credits in course work, six credits in master's thesis research. Nonthesis option—30 credits in course work, comprehensive examination. Students in both options will normally include six credits in disciplines other than philosophy. Proficiency in a foreign language will be required if the student's program committee considers it essential for the thesis topic or the substantial paper involving significant independent research to be written by students choosing the nonthesis option.

PHL Courses Philosophy

401, 402 Special Problems *(I and II, 3 each)*
414 Advanced Studies in Ethics *(I or II, 3)*
430 Philosophy of Law *(I or II, 3)*
440 Philosophy of Language *(I or II, 3)*
451 Symbolic Logic *(I or II, 3)*

Adjunct Associate Professor Kim Boekelheide, M.D., Ph.D., 1980, Duke University
Adjunct Associate Professor Joseph M. Capasso, Ph.D., 1979, St. John's University
Adjunct Associate Research Professor Cecilia T. Giambalvo, Ph.D., 1975, University of Connecticut
Adjunct Associate Professor Herbert V. Levinsky, Ph.D., 1969, College of Agriculture, Vienna
Adjunct Assistant Professor Sandra M. Baksi, Ph.D., 1986, University of Maryland
Adjunct Assistant Professor Douglas O. Fisher, Ph.D., 1979, University of Rhode Island
Adjunct Assistant Professor Dennis C. Hilliard, M.S., 1980, University of Rhode Island
Adjunct Assistant Professor Eugene Jackim, Ph.D., 1965, St. John's University
Adjunct Assistant Professor M.A. Ravi Kiron, Ph.D., 1986, Indian Institute of Science, Bangalore, India

Specializations

Biochemical and cardiovascular pharmacology; biochemical and forensic toxicology.

Master of Science

Admission requirements: GRE and bachelor's degree in pharmacy, biological sciences, or chemistry.

Program requirements: thesis; one course in mathematics (141 or equivalent); one course in statistics; PCL 444, 445, and 446 or equivalent; BCH 581 and 582; PCL 521 and 522 and two advanced pharmacology courses.

Doctor of Philosophy (Pharmaceutical Sciences)

Admission requirements: GRE and bachelor's or master's degree in pharmacy or science.

Program requirements: M.S. program requirements with two additional advanced pharmacology courses. In addition, a Ph.D. qualifying examination is required of all students admitted without an acceptable master's degree.

PCL Courses
Pharmacology and Toxicology

436 (or PSY 436) Psychotropic Drugs and Therapy *(I and II, 3)*
443 General Pharmacology Laboratory *(II, 1)*
444, 445, 446 General and Clinical Pharmacology and Toxicology I, II, III *(I and II, 3 each)*
497, 498 Special Problems *(I and II, 1–3 each)*

521, 522 Seminar *(I and II, 1 each)* Seminar discussions and presentation of papers on selected topics in pharmacology. *(Seminar) Required of all graduate students, with a maximum of 1 credit allowed per year. May be repeated for a maximum of 3 credits.* Staff

544 Forensic Toxicology *(I, 3)* Theoretical and practical aspects of poisoning including the isolation and identification of toxic materials from pharmaceuticals, body fluids, and tissues. Isolation and identification of physiological fluids from stains, hairs, and tissue with application to forensic medicine. *(Lec. 2, Lab. 3) Pre: permission of instructor. In alternate years. Next offered spring 1996.* Staff

546 Advanced Toxicology *(II, 3)* Toxic effects of selected drugs and other xenobiotics on physiological and biochemical processes. *(Lec. 3) Pre: permission of instructor. In alternate years. Next offered fall 1994.* Shaikh

572 Neural Bases of Drug Action *(I, 3)* Review of neuroanatomy, neurochemistry, and neurophysiology as they relate to drug action. *(Lec. 3) Pre: 446 or equivalent or permission of instructor. In alternate years. Next offered fall 1995.* Swonger

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

641 Biochemical Pharmacology *(I, 3)* Theory and application of pharmacological studies at the cellular and subcellular levels and their significance to drug action in the intact organism. *(Lec. 2, Lab. 3) Pre: permission of instructor. In alternate years. Next offered spring 1995.* Chichester

642 (or BCH 642) Biochemical Toxicology *(II, 3)* Biochemical and molecular aspects of chemically induced cell injury and chemical carcinogenesis. *(Lec. 3) Pre: permission of instructor. In alternate years. Next offered spring 1996.* Babson

644 Cardiovascular Pharmacology *(II, 3)* Cellular mechanisms of drug action as a basis for understanding therapeutic effects. Emphasis on current developments in antihypertensive, antiarrhythmic, antianginal, and cardiotonic drug research. *(Lec. 3) Pre: permission of instructor. Next offered fall 1996.* Rodgers

697, 698 Research in Pharmacology *(I and II, 1–5 each)* Literature survey, laboratory work, and a detailed research report on one or more assigned topics. *(Independent Study)* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Pharmacy Administration

M.S.
401-792-2734

Graduate Faculty

Director of Graduate Studies: Professor Norman A. Campbell, Ph.D., 1972, University of Wisconsin
Professor Albert H. Taubman, Ph.D., 1971, University of Pittsburgh
Assistant Professor Cynthia Willey, Ph.D., 1985, University of North Carolina, Chapel Hill
Adjunct Associate Professor Charles Hachadorian, Jr., M.P.A., 1970, University of Rhode Island
Adjunct Assistant Professor Paul E. Larrat, Ph.D., 1992, Brown University

Specializations

Development and utilization of pharmacy resources in health care systems involving the organization, financing, and delivery of health care services and materials and the legal and socioeconomic constraints.

Master of Science

Admission requirements: GRE or MAT and first professional degree in pharmacy.

Program requirements: thesis; PHP 599, 621, 622, 651, 652, STA 409, or equivalents.

Special Financial Aid

Fellowships from the American Foundation for Pharmaceutical Education are available.

PHP Courses
Pharmacy Practice

406 Pharmacy Retailing *(II, 3)*
411 (or STA 411) Biostatistics II *(I, 3)*
453 Drug Marketing Principles *(II, 2)*
455, 456 Pharmacotherapeutics I, II *(I and II, 4 each)*
459 (PCG) Public Health *(I, 3)*
480 Prepaid Drug Plans *(I, 3)*
497, 498 Special Problems *(I and II, 1–3 each)*

530 Behavioral Skills in Clinical Pharmacy *(SS, 3)* Communication skills, behavioral aspects of illness, and the social and ethical considerations of clinical pharmacy. *(Lec. 3) Pre: enrollment in Doctor of Pharmacy program or permission of chairperson.* Staff

540 Principles, Methods, and Applications of Epidemiology *(I, 3)* An introduction to epidemiology, the study of health and disease in populations. Epidemiologic methods and research design for conducting and interpreting health research. *(Lec. 3) Pre: STA 307 or permission of instructor.* Willey

622 Manufacturing Pharmacy *(I or II, 3)* Theories applied to the manufacture of pharmaceuticals with an emphasis on formulation considerations and principles of operation of equipment used for their production. *(Lec. 3) Pre: 621. In alternate years.* Needham

623 Manufacturing Pharmacy Laboratory *(I or II, 2)* Practical application of the principles of all aspects of dose-form manufacture, including an emphasis on good manufacturing procedures. *(Lab.) Pre: credit or concurrent enrollment in 622.* Needham

631 Advanced Physical Pharmacy *(I or II, 4)* Theory and application of physical chemical principles to problems in pharmaceutical research, with emphasis on methods by which properties of new medicinal agents are determined. *(Lec. 4) Pre: permission of instructor.* Zia and Staff

633 Advanced Physical Pharmacy Laboratory *(II, 1)* Laboratory exercises dealing with the physical-chemical principles used in evaluation of pharmaceutical substances. *(Lab. 4) Pre: CHM 435.* Staff

670 Advanced Pharmacokinetics *(I, 2)* Application of classical compartmental and noncompartmental analyses to drug absorption and disposition in linear and nonlinear systems. *(Lec. 2) Pre: 535 or permission of instructor.* Rosenbaum and Staff

680 Industrial Project (Pharmaceutics) *(I, II, or SS, 3)* A research project directed by the major professor on a topic in industrial pharmacy. A report must be submitted to the department faculty. The project will normally be conducted off campus. *(Lab.) Pre: graduate standing in pharmaceutics.* Staff

697, 698 Research in Pharmacy *(I and II, 1–3 each)* Literature survey, laboratory work, and a detailed research report on one or more assigned topics in pharmacy. *(Independent Study)* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Pharmacognosy

M.S., Ph.D. (Pharmaceutical Sciences)
401-792-2751

Graduate Faculty

Acting Chairperson: Professor Raymond P. Panzica, Ph.D., 1972, University of Utah
Associate Professor Ching-Shih Chen, Ph.D., 1985, University of Wisconsin
Assistant Professor Lenore M. Martin, Ph.D., 1988, University of California, Los Angeles
Adjunct Assistant Professor Mostafa M. Omar, Ph.D., 1982, University of Rhode Island

Specializations

Biosynthesis of drug plant constituents, natural product chemistry including the isolation and structural elucidation of materials of potential medicinal interest, screening of natural products for physiologically active agents including materials from both land and marine sources.

Master of Science

Admission requirements: GRE and bachelor's degree in pharmacy, chemistry, or biology.

Program requirements: thesis; A.C.S. placement examination (organic) to determine specific program requirement; PCG 445, 446, or equivalent; PCG 548, 551, 552; and written master's examination.

Doctor of Philosophy (Pharmaceutical Sciences)

Admission requirements: GRE and master's degree in pharmacy, chemistry, or biology, or bachelor's degree in one of these with evidence of superior ability. Qualifying examination is required for candidates accepted without the master's degree.

Program requirements: PCG 551, 552, 633, 634, CHM 521 or equivalent. A candidate entering the Ph.D. program with a bachelor's degree must also meet the M.S. core course requirements.

PCG Courses Pharmacognosy

445, 446 General Pharmacognosy *(I and II, 3 each)*

521, 522 Seminar *(I and II, 1 each)* Seminar discussions including presentation of papers on selected topics in pharmacognosy. *(Seminar) Required of all graduate students, with a maximum of 1 credit allowed per year. May be repeated for a maximum of 3 credits.* Staff

533 Medicinal Plants *(I, 2)* Problems in drug plant chemotaxonomy with field work in the drug plant gardens. Emphasis is placed on certain alkaloid, glycoside, and oil-yielding plants. Weedicides and insecticides as related to measures for control. *(Lec. 1, Lab. 3) Pre: 446 or equivalent.* Staff

536 Antibiotics *(II, 3)* Advanced course on concept of antibiosis, biosynthesis pathways of antibiotic production, testing, chemistry, mechanism of action, medicinal and pharmaceutical uses of antibiotics. Phenomena of sensitivity and resistance; emphasis on entities of importance in pharmaceutical research and production. *(Lec. 3) Pre: graduate or fifth-year undergraduate pharmacy standing. In alternate years.* Staff

548 Physical Methods of Identification See Medicinal Chemistry 548.

551, 552 Chemistry of Natural Products *(I and II, 3 each)* Introduction to chemistry of certain groups of natural products especially in relation to their chemotaxonomic position in plant classification. Topics limited to secondary metabolites, e.g., terpenoids, phenolic compounds, aromatic compounds, phytosterols, alkaloids. *(Lec. 3) Pre: CHM 228 and 230. In alternate years. Next offered 1995–96.* Shimizu

597, 598 Special Problems *(I and II, 1–3 each)* Special graduate student project assignments in the study of natural drug research under the supervision of faculty. *(Independent Study) Pre: graduate standing. May be repeated for a maximum of 6 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

633, 634 Biosynthesis *(I and II, 3 each)* Biogenesis of medicinally active principles of biological origin. Emphasis given to organic acids, polysaccharides, glycosides, steroids, and certain nitrogenous compounds. *(Lec. 3) In alternate years. Next offered 1994–95.* Staff

635, 636 Pharmacognosy Techniques *(I and II, 3–4 each)* Physical and chemical factors influencing growth and development of active principles of drug plants. Certain biological analyses of results are performed. *(Lec. 1, Lab. 6–9)* Staff

697, 698 Research in Pharmacognosy *(I and II, 1–3 each)* Literature survey, laboratory work, and a detailed research report on one or more assigned topics. *(Independent Study)* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Pharmacology and Toxicology

M.S., Ph.D. (Pharmaceutical Sciences)
401-792-2362

Graduate Faculty

Chairperson: Professor Zahir A. Shaikh, Ph.D., 1972, Dalhousie University, Canada
Professor Alvin K. Swonger, Ph.D., 1971, Dartmouth College
Professor Yuzuru Shimizu, Ph.D., 1963, Hokkaido University
Associate Professor John R. Babson, Ph.D., 1980, Oregon State University
Associate Professor Clinton O. Chichester III, Ph.D., 1980, University of Rhode Island
Associate Professor Robert L. Rodgers, Ph.D. 1977, University of Oklahoma
Research Assistant Professor Lucie Maranda, Ph.D., 1987, University of Rhode Island
Adjunct Professor Alexander R. Malcolm, Jr., Ph.D., 1977, University of Rhode Island
Adjunct Associate Professor Hans-Jurgen H. Barrach, Ph.D., 1973, Free University of Berlin

671 Marine Zooplankton Ecology *(II, 3)* Marine zooplankton community structure and function including the relation of spatial and temporal distribution patterns to the oceanic environment, organism interactions, secondary production, feeding, and reproduction. Emphasis on open ocean communities. *(Lec. 3) Pre: 561 or permission of instructor.* Wishner

672 Marine Invertebrates and Environment *(I, 3)* Physiological responses of marine invertebrates to seasonal and geographical changes in the environment. Survival, metabolism, reproduction, and larval development of the populations. Mechanisms in adaptation during stages in life cycle examined in relation to changes of certain environmental factors. Physiological variation of populations related to speciation process. Lectures, reading, and discussion. Research project. *(Lec. 3) Pre: 561 and permission of instructor.* Staff

678 Low-Temperature Geochemistry and Isotope Geology *(II, 3)* A study of processes important in determining the chemical and isotopic mass balance of the oceans and the geochemistry of deep-sea sediments. *(Lec. 3) Pre: 521.* Bender

679 (or ZOO 679) Animal Communication *(I, 2)* Visual, chemical, and auditory communication in animals, including receptor systems, feedback, and redundancy. Functional aspects and organization of communication. Discussion of readings. Research problem can be taken under 691 or ZOO 693. *(Lec. 2) Pre: ZOO 467 or equivalent and permission of instructor. In alternate years. Next offered 1995.* Winn

681 Marine Pollution *(II, 3)* The chemical and biological processes governing the fate and effects of pollutants in the marine environment are introduced. Approaches used in the analyses and modeling of marine pollution will be introduced. *(Lec. 3) Pre: 521, 561, or permission of instructor.* Staff

689 Coastal Marine Ecosystems *(II, 3)* Comparative analysis of community structure in estuaries and shelf waters. Biological characterization of specific habitats with respect to general properties of the physical-chemical-geological environment. Class-developed databases for comparisons of Narragansett Bay with estuaries of the world. *(Lec. 2, Lab. 1) Pre: 561.* Staff

691, 692 Individual Study *(I and II, 1–6 each)* Individual study of assigned topics or special problems, involving literature search and/or original investigation under one or more members of the staff. *(Independent Study)* Staff

693, 694 Special Studies *(I and II, 1–4 each)* Studies of specialized topics in the marine sciences. *(Independent Study)* Staff

695 Seminar in Oceanography *(I and II, 1 each)* Students to give seminar reports on problems and current research in various areas of oceanography. *(Seminar) Attendance and registration are required of all graduate students in residence, but no more than 2 credits are allowed for a program of study. S/U credit.* Yoder

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Oceanography Topics for Teachers *(I and II, 0–3)* Especially designed for teachers of physical sciences. Basic topics in oceanography from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Staff

Note: Graduate students in oceanography choose from supporting courses in other departments.

Pharmaceutics

M.S., Ph.D. (Pharmaceutical Sciences)
401-792-2754

Graduate Faculty

Chairperson: Professor Thomas E. Needham, Ph.D., 1970, University of Rhode Island
Professor Joan M. Lausier, Ph.D., 1971, University of Rhode Island
Professor Serpil Kislalioglu, Ph.D., 1973, University of London
Professor Louis A. Luzzi, Ph.D., 1966, University of Rhode Island
Professor Christopher T. Rhodes, Ph.D., 1964, Chelsea College, University of London
Associate Professor Sara Rosenbaum, Ph.D., 1980, University of Liverpool
Associate Professor Hossein Zia, Ph.D., 1969, University of Georgia

Specializations

Pharmaceutics with emphasis on physical pharmacy, biopharmaceutics, pharmacokinetics, formulation and manufacturing of conventional, drug delivery, and cosmetic products, drug standards and regulatory affairs.

Master of Science

Admission requirements: GRE, bachelor's degree in pharmacy or equivalent, and CSC 201 or equivalent.

Program requirements: thesis; STA 409 or equivalent; BCH 435; PHC 521, 522; nine credits of 500- or 600-level pharmaceutics courses. For the cosmetic science technology track—thesis; STA 409; BCH 435 or CHE 542; PHC 521, 522, 530, 531, 532; and 10 credits of electives with one course selected from 500- or 600-level pharmaceutics courses.

Doctor of Philosophy (Pharmaceutical Sciences)

Admission requirements: same as for master's degree.Written and qualifying examinations are required for all candidates.

Program requirements: dissertation; M.S. core requirements plus PHC 521, 522 and IME 533; and comprehensive examination. In addition, for the pharmaceutical formulation track—CHE 530; six credits from CHM 512, MIC 533 and 552, FSN 447, PHP 680, and CHM 511; and 10 additional credits of 500- or 600-level pharmaceutics courses. For the regulatory affairs track—PHC 535, 621, 670, 680, PCL 546, PHP 540, 680, CHM 511; six credits from PHC 622, 623, 631, 633, PHP 540, 680, CHM 511; and six credits from PHC 622, 623, 631, 633, PHP 640X, PED 564, MGT 630, MKT 601, MIC 533, 552.

PHC Courses
Pharmaceutics

497, 498 Special Problems *(I and II, 1–3 each)*

521, 522 Seminar *(I and II, 1 each)* Seminar discussions including presentation of papers on selected topics in pharmacy. *(Seminar) Required of all graduate students, with a maximum of 1 credit allowed per year. May be repeated for a maximum of 2 credits for M.S. candidates. May be repeated for a maximum of 5 credits for Ph.D. candidates.* Rhodes

530 Fundamentals of Cosmetic Science *(I, 3)* Study of the fundamentals of the function and behavior of skin, hair, and nails and their reactivity to cosmetic raw materials. Properties of cosmetic ingredients will also be addressed. *(Lec. 3) Pre: permission of instructor.* Kislalioglu and Staff

531 Basic Research in Cosmetic Science *(I, 2)* Laboratory exercises in the form of individual projects designed to provide an understanding of the basic properties and behavior of skin, hair, and nails. Assessment of cosmetic product performance and the basic properties of cosmetic ingredients. *(Lab.) Pre: permission of instructor.* Kislalioglu and Staff

532 Cosmetic Product Formulation *(II, 2)* Provide a basic understanding of cosmetic products, technology, and quality control; improve formulation skills with a particular emphasis on the application of new technological developments in cosmetic formulation. *(Lab.) Pre: permission of instructor.* Kislalioglu and Staff

535 Pharmacokinetics *(II, 3)* The principles and application of clinical pharmacokinetics for advanced pharmacy students. Developing, modifying, and evaluating dosage regimens. *(Lec. 3)* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

621 Manufacturing Pharmacy *(I or II, 2)* Theory and practice in the manufacture of pharmaceuticals and the principles of operation of the equipment used for their production. *(Lec. 2)* Rhodes

structor. May be repeated for a maximum of 4 credits. Staff

610 Geophysical Fluid Dynamics I *(I, 3)* Natural world fluid dynamics emphasizing ocean circulation. Classical fluid dynamics; GFD fundamentals (rotation and stratification); Taylor-Proudman theorem; potential vorticity; planetary waves; geostrophic contours; shallow water quasi-geostrophic theory; frictional layers. *(Lec. 3) Pre: 606 or permission of instructor.* Hara

611 Geophysical Fluid Dynamics II *(II, 3)* Continuously stratified quasi-geostrophic theory; classical and modern theories of the wind-driven ocean circulation; stability theory; oceanic convection; wave-mean flow interactions; ageostrophic dynamics; topographical effects. *(Lec. 3) Pre: 610 or permission of instructor.* Rothstein

613 Waves *(II, 3)* Generation, propagation, and decay of surface waves, internal waves, and Rossby waves in the ocean. *(Lec. 3) Pre: MCE 550 or permission of instructor.* Wimbush

614 Tides *(I, 2)* Generation, propagation, and dissipation of ocean tides. Earth tides. Relation between theory and observation. Tidal analysis. *(Lec. 2) Pre: 501.* Wimbush

620 Chemical Distributions *(II, 3)* Interdisciplinary study of the processes responsible for oceanic chemical distributions with emphasis on conservative properties, biologically active constituents, and radionuclides. Includes projects involving data processing analysis. *(Lec. 3) Pre: 501, 521, 540, and 561 or permission of instructor.* Kester

623 Physical Chemistry of Seawater *(I, 3)* Characterization of dissociation, solubility, and redox equilibria in seawater. Partial molar volumes, conductivity, and diffusion of ions in seawater. Kinetic studies in seawater; effect of temperature, salinity, and pressure on physiochemical properties in seawater. *(Lec. 3) Pre: 521 and CHM 432 or permission of instructor. Offered in odd-numbered years. Next offered fall 1995.* Kester

625 Organic Geochemistry of Sediments *(I, 3)* Chemistry of organic matter in recent to ancient sediments. Topics include the source, characterization, significance and fate of sedimentary organic compounds with emphasis on the marine environment. *(Lec. 3) Pre: 523 or permission of instructor. Offered in even-numbered years.* Quinn

628 High-Temperature Geochemistry *(I, 3)* Principles and factors governing the distribution of trace elements in volcanic processes. Applications to the study of rock genesis, mantle dynamics, oceanic crust formation, and hotspots. *(Lec. 3) Pre: CHM 431 or equivalent, or permission of instructor. Offered in even-numbered years. Next offered fall 1994.* Schilling

631 Seminar in Marine and Atmospheric Chemistry *(I and II, 1)* Discussion of problems of current interest in marine chemistry. *(Seminar) Pre: 521 or permission of instructor. S/U credit.* Staff

643 Subduction Zones *(II, 3)* Structure, petrology, and geochemistry of subduction zones, island arcs, and other magmatic arcs at convergent plate margins. Petrogenesis of andesites and related magmas. *(Lec. 3) Pre: 540 or permission of instructor.* Sigurdsson

644 Global Paleoclimatology *(I, 3)* Principles of modern climatology, climate dynamics, modelling, and climate indicators with application to the geologic record; Phanerozoic climates and relationships to tectonics, paleogeography, and ocean-atmosphere composition. *(Lec. 2, Lab. 2) Pre: 510 and 540. In alternate years. Next offered fall 1995.* Hagelberg

645 Petrology of the Oceanic Crust *(I, 3)* Nature and origin of igneous and metamorphic rocks of the oceanic crust of the earth; mineralogy, petrology, and petrogenesis of sea-floor rocks; metamorphism of the ocean crust. *(Lec. 3) Pre: graduate standing or permission of instructor.* Sigurdsson

646 Deep-Sea Sediments and Processes *(II, 3)* Deep-sea sediments and their relation to oceanic processes such as solution, productivity, and dilution. Sedimentary distributions in time and space as related to tectonic models. Paleoclimatology, and past water mass distributions and conditions. Term paper. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years. Next offered 1995.* Leinen

649 Plankton Paleoecology *(I, 3)* Concepts of paleoecology. Interaction between planktonic marine organisms and their environment over evolutionary time-scales. The use of fossil plankton in reconstructing paleoenvironmental conditions and paleoecological systems. Patterns, causal hypotheses, and geological consequences of temporal and geographic variation in Cretaceous and Cenozoic plankton assemblages. *(Lec. 2, Lab. 2) Pre: permission of instructor. In alternate years. Next offered fall 1994.* D'Hondt

651 Marine Stratigraphy *(I, 3)* Concepts and methods of biostratigraphy, lithostratigraphy, and chronostratigraphy. Stratigraphic nomenclature. Stratigraphic correlation and completeness. Special focus will be placed on the integration of multiple stratigraphic techniques and their application to the Cretaceous and Cenozoic marine record. Class discussion of advances and problems in recent research articles. *(Seminar) Pre: permission of instructor. In alternate years. Next offered fall 1995.* D'Hondt

652 Marine Geophysics *(II, 3)* Survey of basic subdisciplines of marine geophysics including plate tectonics, gravity, magnetics, heat flow reflection, and refraction seismology. Basic theory and methods of data collection and interpretation emphasized. *(Lec. 3) Pre: 540 or permission of instructor.* Staff

655 Paleomagnetism and Geomagnetism *(II, 3)* Earth's magnetic field, origin and dynamo theory, rock magnetism and paleomagnetism, field directions in rocks and sediments, and temporal variation. Magnetic recording by ridges and seamounts; forward/inverse modeling, skewness analysis. *(Lec. 3) Pre: 540 or permission of instructor. In alternate years.* Larson or King

661 (or BOT 661) Phytoplankton Taxonomy *(I, 3)* Classical and modern systems and techniques for the identification, nomenclature, and classification of planktonic algae, with emphasis on marine forms. Phylogeny will be briefly considered. *(Lec. 1, Lab. 4) Pre: permission of instructor. In alternate years. Next offered fall 1994.* Hargraves

663 (or BOT 663) Phytoplankton Physiology *(I, 3)* Metabolic processes and methods of their investigation in phytoplankton with primary emphasis on functions pertinent to their ecology. Includes adaptation, uptake of nutrients, excretion, rhythms, pigments, and photosynthesis. *(Lec. 3) Pre: graduate standing or permission of instructor.* Swift

664 (or BOT 664) Phytoplankton Ecology *(II, 3)* Biology and ecology of the pelagic marine microscopic algae with emphasis on their adaptations, physiological ecology, distribution, succession, production, and regional and seasonal dynamics. *(Lec. 3) Pre: permission of instructor.* Smayda

665 Marine Bio-Optics and Remote Sensing *(II, 3)* Bio-optical properties of ocean waters. Major focus is on basic principles of visible-band ocean remote sensing and its application to determining phytoplankton pigment and production at regional to global scales. *(Lec. 2, Lab. 2) Pre: 561. In alternate years. Next offered spring 1995.* Yoder or Swift

666 Zooplankton *(II, 3)* Biology of marine zooplankton, dealing with morphology, adaptation, distribution, physiology, production, and interrelationships with other members of the marine biota. *(Lec. 1, Lab. 4) Pre: permission of instructor.* Staff

667 (or BOT 667) Advanced Phytoplankton Seminar *(II, 1)* Specialized and advanced areas of phytoplankton biology and research, including systematics, physiology, and ecology. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated. S/U credit.* Hargraves, Smayda, and Swift

668 Productivity of Ocean Margins *(II, 3)* Processes affecting biological productivity of ocean margin waters. Major focus on dynamics of production in mid to outer shelf waters and adjacent boundary currents. *(Lec. 3) Pre: 501, 561. In alternate years. Next offered spring 1996.* Yoder

669 Marine Fish Ecology and Production *(II, 3)* Functioning of fishes in major world ecosystems is explored through comparison of feeding ecology, bioenergetics, and production rates. *(Lec. 2, Lab. 2) Pre: 561 or permission of instructor.* A. Durbin and E. Durbin

670 Fish Population Dynamics *(II, 3)* Methods for estimating vital statistics of fish populations, stock assessment theory and methods, analytical and empirical model development, and fisheries forecasting. *(Lec. 3) Pre: graduate standing or permission of instructor.* Collie

Assistant Professor Bradley Moran, Ph.D., 1991, Dalhousie University
Professor Emeritus H. Perry Jeffries, Ph.D., 1959, Rutgers—The State University
Professor Emeritus John A. Knauss, Ph.D., 1959, University of California
Professor Emeritus Saul B. Saila, Ph.D., 1952, Cornell University
Professor Emeritus John McN. Sieburth, Ph.D., 1954, University of Minnesota
Associate Professor Emeritus Theodore A. Napora, Ph.D., 1964, Yale University

Specializations

Biological, chemical, geological, and physical oceanography.

Master of Science

Admission requirements: GRE (aptitude required, advanced in the applicant's undergraduate major recommended) and bachelor's degree in natural sciences or engineering. Most applicants are admitted for September, but admission for the start of the second semester is possible. Due to the limited number of students that can be accepted as degree candidates, no application will be considered which shows an undergraduate average of less than B unless there is postbaccalaureate work indicating outstanding ability. To ensure full consideration for admission and financial support, the completed application packet should be received by January 15.

Program requirements: thesis, OCG 695, and participation in a regular ocean research cruise. For specialization in biological and chemical oceanography, OCG 501, 521, 540, and 561; for specialization in geological oceanography, six credits of 500- and 600-level OCG courses outside the geological oceanography discipline (not including OCG 695); for specialization in physical oceanography, OCG 501, 510, and any two of OCG 605, 610, and 613.

Doctor of Philosophy

Admission requirements: GRE (aptitude required, advanced in the applicant's undergraduate major recommended); bachelor's degree in natural sciences or engineering. Most applicants are admitted for September, but admission for the start of the second semester is possible. Due to the limited number of students that can be accepted as degree candidates, no application will be considered which shows an undergraduate average of less than B unless there is postbaccalaureate work indicating outstanding ability. To ensure full consideration for admission and financial support, the completed application packet should be received by January 15.

Program requirements: comprehensive examination; dissertation; OCG 695; participation in a regular ocean research cruise; six credits of 600-level OCG courses (excluding problems and research courses and OCG 695). For specialization in biological or chemical oceanography, OCG 501, 521, 540, and 561; for specialization in geological oceanography, OCG 540 and any two of OCG 501, 521, and 561; for specialization in physical oceanography, OCG 501, 510, 605, and 613 and any six credits of 500- and 600-level OCG courses outside the physical oceanography discipline. A Ph.D. qualifying examination is required of all doctoral students. This requirement is satisfied by completing, with a grade of B or better, the courses specified for the appropriate discipline.

Special Financial Aid

There is a limited number of assistantships for master's and doctoral candidates.

General Information

It is anticipated that approximately 25 students will be admitted to the program for the 1994–95 academic year.

OCG Courses
Oceanography

401 General Oceanography *(I and II, 3)*
483, 484 (or AST 483, 484 or PHY 483, 484) Laboratory and Research Problems in Physics
491 Ocean Studies *(I and II, 15)*
493, 494 Special Problems and Independent Study in Oceanography *(I and II, 1–6 each)*

501 Physical Oceanography *(I, 3)* Basic course covering physical properties of seawater, heat budget, distribution of variables, dynamics, water masses and general circulation, waves and tides. *(Lec. 3) Pre: PHY 213 and MTH 141.* Hebert

510 Descriptive Physical Oceanography *(II, 3)* Observed distributions of temperature, salinity, currents; methods of deducing deep flow; physical properties of seawater; flow in estuaries; practical work in the analysis of oceanographic data; study of recent literature. *(Lec. 3) Pre: 501.* Rossby

521 Chemical Oceanography *(II, 3)* Processes regulating the composition of seawater and the distribution of chemical species. The interaction of marine chemistry with the ocean floor, atmosphere, and marine organisms. *(Lec. 2, Lab. 2) Pre: CHM 101 and 112 and PHY 213.* Pilson

523 Organic Geochemistry of Natural Waters *(I, 3)* Chemistry of organic matter in natural waters with emphasis on the marine environment. Topics include a consideration of the origin, nature, and biogeochemical reactions of organic matter in aquatic environments. *(Lec. 3) Pre: CHM 228 or permission of instructor. Offered in odd-numbered years.* Quinn

524 Chemistry of the Marine Atmosphere *(II, 3)* Chemistry and physics of marine aerosols, trace gases, and precipitation; cycles and budgets of atmospheric nitrogen, sulfur, halogen, and carbon compounds; effects of man on the marine atmosphere. *(Lec. 3) Pre: 521 and CHM 432 or permission of instructor. In alternate years. Next offered 1995.* Staff

531 Synoptic and Dynamic Meteorology *(I, 3)* Observed structure of atmosphere; principles of balanced flows, waves, and disturbances. Observations and models of storm formation, semipermanent features, and general circulation. Relationship between weather and climate. *(Lec. 3) Pre: PHY 203 or permission of instructor.* Merrill

540 Geological Oceanography *(II, 3)* Origin and evolution of the ocean basin and its margin: morphology, structure, plate tectonics, volcanism, geochemistry, stratigraphy, sedimentation, and paleoceanography. *(Lec. 2, Lab. 2) Pre: GEL 103 or 105 or permission of instructor.* Staff

561 Biological Oceanography *(I, 4)* Dynamics of marine ecosystems; patterns of production and distribution of plankton, benthos, and nekton in relationship to their environment. *(Lec. 3, Lab. 2) Pre: general ecology.* Oviatt

574 Biology of Marine Mammals *(II, 3)* Migration, reproduction, social organization, classification, anatomy, populations, physiology, and communications of cetaceans and pinnipeds. *(Lec. 2, Lab. 2) Pre: permission of instructor. In alternate years. Next offered 1996.* Winn

576 (or MIC 576) Marine Microbiology *(I, 4)* The role of bacteria, fungi, apochlorotic algae, flagellates, sarcodines, and ciliates in the cycling of organic matter is discussed in the context of their structure, habitats, trophic modes, ecology, processes, and taxonomy. *(Lec. 3, Lab. 3) Pre: CHM 112 and MIC 201 or 211 or permission of instructor. Offered in odd-numbered years.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.* Staff

605 Dynamical Oceanography *(II, 3)* Simple steady-state theories applied to ocean motion. Review of well-known force balances in oceanography, wind-driven circulation, thermohaline circulation, the thermocline, oceanic boundary layers, near-shore circulation, diffusion. *(Lec. 3) Pre: 501.* Watts

606 Aquatic Community Ecology *(II, 3)* Lectures and discussion of controversial topics contrasting marine and freshwater communities. Current topics of interest will vary on a yearly basis. *(Lec. 3) Pre: permission of instructor.* A. Durbin, E. Durbin, or Twombly

607 Geophysical Models *(I, 1–4)* Selected laboratory experiments modeling the motions of oceans and atmospheres. Comparison of effects of rotation and stratification. Thermal and thermohaline convection, inertial waves and boundary layer phenomena. Emphasis on experimental research techniques and preparation of technical reports. *(Lec. 1, Lab. 2–8) Pre: 610 or permission of in-*

resident graduate students. May be repeated for a maximum of 2 nonprogram credits. S/U credit. Staff

611 Coastal and Estuarine Environmental Modeling *(I, 3)* Numerical modeling techniques to solve problems in coastal and estuarine circulation and pollutant transport. Application of models to predict tidal, wind, and density-forced circulation, constituent and sediment transport, oil and chemical spill transport. *(Lec. 3) Pre: 510 or permission of instructor.* Spaulding

614 Coastal Modeling *(II, 3)* Mild slope equation. Parabolic wave equation. Harbor oscillations and wave field modeling (refraction—diffraction). Nearshore hydrodynamic models. Fully nonlinear wave model (boundary elements) and applications. *(Lec. 3) Pre: 514.* Grilli

623 Random Waves and Vibrations *(II, 3)* Random ocean waves; random wave kinematics and forces; wave kinematics near ocean surface; linear and second-order random wave theories; wave simulations; linear random vibration; nonlinear stochastic dynamic analysis. *(Lec. 3) Pre: 522.* Hu

661 Analysis of Oceanographic Data Systems *(I, 3)* Design of systems for deep-ocean and estuarine data collection and processing. Space-time sampling, multivariate analysis, and convergence of moments as applied to ocean data estimation and system design. Current topics in ocean data systems. *(Lec. 3) Pre: ELE 506 or equivalent.* Stepanishen

666 Ocean Laboratory II *(I, 3)* Advanced design/laboratory course in ocean mapping and instrumentation. Students work as a team designing and deploying ocean instrumentation, including sonars, navigation systems, vessels, buoys, underwater sensors, at locations of opportunity. *(Lec. 1, Lab. 6) Pre: 565 or permission of instructor.* Tyce

672 (or ELE 672) Underwater Acoustics II *(II, 3)* Sound transmission in ocean, transducers, active signal design for range and Doppler resolution, ambient and platform noise, classical and wave vector-frequency methods of beamforming, adaptive beamforming, characteristics of targets, and active/passive sonar systems. *(Lec. 3) Pre: 571.* Stepanishen

673 Advanced Course in Underwater Acoustic Propagation *(I, 3)* Analysis of propagation from a concentrated acoustic source in the ocean by methods such as advanced normal mode theory, numerical integration, and Fast Fourier Transforms. Applications to ocean features such as surface ducts, shadow zones, deep-sound channel, etc. *(Lec. 3) Pre: 571 or equivalent.* Stepanishen

674 Nonlinear Acoustics *(I or II, 3)* Topics in the nonlinear acoustics of fluids, propagation and interactions of finite-amplitude sound waves, parametric sonar, sound generation by turbulence, cavitation noise, shock waves, underwater explosions, radiation pressure and acoustic streaming. *(Lec. 3) Pre: 571 or permission of instructor.* Stepanishen

675 Processing of Underwater Acoustic Data *(II, 3)* Description of the underwater acoustic environment. Methods of measuring underwater acoustic signals. Data analysis of passive and active signals. Applications of underwater acoustics to oceanographic survey. *(Lec. 3) Pre: ELE 506 or equivalent.* Stepanishen

676 Acoustic Radiation from Underwater Vibrators *(I or II, 3)* Fundamentals of acoustic radiation from submerged structures. Radiation from planar, cylindrical, and spherical surfaces. In-vacuo and in-fluid vibration of elastic bodies. Acoustic coincidence and fluid-loading effects on radiation from elastic bodies. *(Lec. 3) Pre: 571 or permission of instructor.* Stepanishen

677 (or ELE 677) Statistical Sonar Signal Processing *(I or II, 3)* Basic results in probability and statistics, signal processing, and underwater acoustics are applied to the design of detection, estimation, and tracking in active sonar, passive sonar, and underwater acoustic communication. *(Lec. 3) Pre: MTH 451 or ELE 509, ELE 506, and ELE 571 (or OCE 571), or equivalents. ELE 510 is useful and closely related, but not required.* Stepanishen or Tufts

688 (or CVE 688) Marine Geomechanics *(I or II, 3)* Integrated study of marine geotechnics and marine geology. Topics include sedimentary processes, acoustic characteristics, slope stability, consolidation and stress history, engineering properties and other subjects related to seabed utilization. *(Lec. 3) Pre: CVE 381 or permission of instructor.* Silva

691, 692 Special Problems *(I and II, 1–6 each)* Advanced work under supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Oceanography

M.S., Ph.D.
401-792-6246

Graduate Faculty

Dean: Professor Margaret Leinen, Ph.D., 1979, University of Rhode Island
Associate Dean: Professor James A. Yoder, Ph.D., 1979, University of Rhode Island
Professor Michael L. Bender, Ph.D., 1970, Columbia University
Professor Peter Cornillon, Ph.D., 1973, Cornell University
Professor Ann G. Durbin, Ph.D., 1976, University of Rhode Island
Professor Edward G. Durbin, Ph.D., 1976, University of Rhode Island
Professor Paul J. Fox, Ph.D., 1972, Columbia University
Professor Paul E. Hargraves, Ph.D., 1968, College of William and Mary
Professor Barry J. Huebert, Ph.D., 1970, Northwestern University
Professor Dana R. Kester, Ph.D., 1969, Oregon State University
Professor Roger L. Larson, Ph.D., 1970, University of California, San Diego
Professor Scott W. Nixon, Ph.D., 1969, University of North Carolina
Professor Candace A. Oviatt, Ph.D., 1967, University of Rhode Island
Professor Michael E.Q. Pilson, Ph.D., 1964, University of California, San Diego
Professor James G. Quinn, Ph.D., 1967, University of Connecticut
Professor Kenneth A. Rahn, Ph.D., 1971, University of Michigan
Professor Hans T. Rossby, Ph.D., 1966, Massachusetts Institute of Technology
Professor Jean-Guy Schilling, Ph.D., 1966, Massachusetts Institute of Technology
Professor Haraldur Sigurdsson, Ph.D., 1970, Durham University
Professor Theodore J. Smayda, Dr.Philos., 1967, University of Oslo
Professor Elijah Swift V, Ph.D., 1967, Johns Hopkins University
Professor Robert C. Tyce, Ph.D., 1976, Scripps Institution of Oceanography
Professor D. Randolph Watts, Ph.D., 1973, Cornell University
Professor Mark Wimbush, Ph.D., 1969, Scripps Institution of Oceanography
Professor Howard E. Winn, Ph.D., 1955, University of Michigan
Professor Karen Wishner, Ph.D., 1979, Scripps Institution of Oceanography
Associate Professor Jeremy S. Collie, Ph.D., 1985, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution
Associate Professor Brian G. Heikes, Ph.D., 1984, University of Michigan
Associate Professor John King, Ph.D., 1983, University of Minnesota
Associate Professor John T. Merrill, Ph.D., 1976, University of Colorado
Associate Professor Lewis M. Rothstein, Ph.D., 1983, University of Hawaii
Assistant Research Professor Richard Arimoto, Ph.D., 1981, University of Connecticut
Assistant Professor Steven N. Carey, Ph.D., 1983, University of Rhode Island
Assistant Professor Steven D'Hondt, Ph.D., 1990, Princeton University
Assistant Professor Teresa King Hagelberg, Ph.D., 1993, Oregon State University
Assistant Professor Tetsu Hara, Ph.D., 1990, Massachusetts Institute of Technology
Assistant Professor David L. Hebert, Ph.D., 1988, Dalhousie University, Canada
Assistant Professor Christopher R. Kincaid, Ph.D., 1989, Johns Hopkins University

Ocean Engineering

M.S., Ph.D.
401-792-2273

Graduate Faculty

Chairperson: Professor Malcolm L. Spaulding, Ph.D., 1972, University of Rhode Island
Director of Graduate Studies: Professor Peter R. Stepanishen, Ph.D., 1969, Pennsylvania State University
Professor Richard Brown, Ph.D., 1977, University of Cambridge
Professor Armand J. Silva, Ph.D., 1965, University of Connecticut
Professor Robert C. Tyce, Ph.D., 1976, University of California, Scripps Institution of Oceanography
Professor Frank White, Ph.D., 1959, Georgia Institute of Technology
Professor Raymond M. Wright, Ph.D., 1981, Pennsylvania State University
Associate Professor Stephan Grilli, Ph.D., 1985, University of Liege
Associate Professor Sau-Lon James Hu, Ph.D., 1984, Rice University
Adjunct Professor David H. Shonting, Sc.D., 1966, Massachusetts Institute of Technology
Adjunct Associate Professor James S. Uhlman, Ph.D., 1983, Massachusetts Institute of Technology

Specializations

Ocean instrumentation and data analysis, underwater acoustics, marine hydrodynamics, marine geomechanics, coastal and nearshore processes, coastal and offshore structures, remote sensing, and composite materials and corrosion.

Master of Science

Admission requirements: B.S. degree in engineering, physics, applied mathematics, or other technical disciplines. Students with a nonengineering background may be required to make up deficiencies by taking undergraduate courses in thermodynamics, fluid mechanics, strength of material, electrical circuits, or applied mathematics.

Program requirements: Core requirements of four courses selected from OCE 510, 514, 522, 534, 560, 561, 565, 571, 582, one course selected from OCG 501, 521, or 540, or an advanced-level oceanography course. Thesis option—a total of 30 credits, including core requirements plus thesis and at least nine credits of electives exclusive of OCE 605, 606. Nonthesis option for part-time students—permission of chairperson; a total of 33 credits, including core requirements plus 18 credits exclusive of OCE 605, 606, but including at least one course requiring a substantial paper involving significant independent study; and a written master's examination.

Doctor of Philosophy

Admission requirements: M.S. degree in engineering or equivalent; exceptional students with a Bachelor of Science will also be considered. All students will be required to complete the OCE and OCG core courses for the M.S. degree in ocean engineering if equivalent courses are not included in their master's degree.

Program requirements: Ph.D. qualifying examination, dissertation, one advanced applied mathematics course, one graduate-level course in another engineering department, one additional oceanography and two additional ocean engineering courses. Students entering with a master's degree will be required to complete a minimum of 30 credits of course work including the above-noted courses. Students entering with a bachelor's degree will be required to complete at least 60 credits, which also includes the courses required for the M.S. in ocean engineering.

Special Financial Aid

Graduate and research assistantships are available for highly qualified students. Some industrial and other fellowships are also available.

General Information

Programs of study can be designed for individuals who are employed on a full-time basis.

OCE Courses
Ocean Engineering

403, 404 (or CHE 403, 404) Introduction to Ocean Engineering Processes I, II *(I and II, 3 each)*
421 Marine Structure Design *(II, 3)*
483 (or CVE 483) Foundation Engineering *(II, 3)*

510 Engineering Ocean Mechanics *(II, 3)* Fundamental equations of estuarine and coastal hydrodynamics. Scaling of governing equations. Long period waves including seiches, tides, storm surges, and tsunamis. Wind- and estuarine-induced circulation. Pollutant and sediment transport. *(Lec. 3) Pre: MCE 354 or equivalent.* Spaulding

514 Engineering Wave Mechanics and Nearshore Processes *(I, 3)* Linear water wave boundary value problem. Engineering wave properties. Nonlinear waves (long waves, Stokes waves, stream function waves). Nearshore hydrodynamics and wave breaking. Fully nonlinear transient waves. *(Lec. 3) Pre: MCE 455 or equivalent.* Grilli

522 Dynamics of Waves and Structures *(I, 3)* Deterministic analysis for SADOF structures; MDOF dynamic analysis; distributed-parameter systems; linear and second-order Stokes wave theories; wave forces on cylinders; chaotic vibration of marine structures. *(Lec. 3) Pre: MCE 464 or permission of instructor.* Hu

534 Corrosion and Corrosion Control
See Chemical Engineering 534.

535 Advanced Course in Corrosion
See Chemical Engineering 535.

537 Advanced Materials Engineering
See Chemical Engineering 537.

560 Introduction to Data Collection Systems *(I, 3)* Practical problems of data collection. Probes and sensors, interfaces, signal conditioning, and storage. Examples found among the current research areas within ocean engineering will be emphasized. *(Lec. 3) Pre: graduate standing in engineering or permission of instructor. In alternate years. Next offered fall 1995.* Tyce

561 Introduction to the Analysis of Oceanographic Data *(I, 3)* Design of oceanic experiments to determine spatial and temporal sampling rate, precision, accuracy, signal-to-noise ratio, etc. Description of typical ocean data collection and analysis systems. Development of relevant techniques. *(Lec. 3) Pre: IME 411, MTH 451, or equivalent.* Stepanishen

565 Ocean Laboratory I *(I or II, 3)* Measurements, experiments, operation of apparatus in the ocean and in the laboratory. Statistical theory, planning multivariable experiments, checking of data, etc. *(Lec. 1, Lab. 6) Pre: graduate standing in engineering or oceanography, or permission of instructor.* Tyce

571 (or ELE 571) Underwater Acoustics I *(I, 3)* Introduction to sound generation, transmission, and reception, including vibration of mechanical systems, acoustic waves in fluids, acoustic transducers and arrays, acoustic propagation in the ocean, and sonar systems. *(Lec. 3)* Stepanishen

581 Experimental Geomechanics
See Civil and Environmental Engineering 581.

582 (or CVE 582) Seabed Geotechnics *(I or II, 3)* Geotechnical engineering principles as applied to submarine slope stability, bearing capacity, anchoring; emphasis on effective stress principle, compressibility, and shear strength of marine sediments. *(Lec. 3) Pre: CVE 381 or equivalent.* Silva

583 Advanced Foundation Engineering
See Civil and Environmental Engineering 583.

591, 592 Special Problems *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

605, 606 Ocean Engineering Seminar *(I and II, 1 each)* Seminar discussions including presentation of papers based on research or literature survey. *(Seminar) Required of all*

562 Advanced Clinical Study of Nursing Practice in Critical Care *(I, 6)* Study and application of the theories of practice and of biopsychosocial interaction in advanced critical care nursing. Analysis of patient problems and nursing strategies relevant to critical care patients. *(Practicum) Pre: 501, 502, and credit or concurrent enrollment in 561. In alternate years. Next offered 1994–95.* Fortin

563 Advanced Clinical Study of Nursing Practice in Gerontology *(I, 6)* Study and application of the theories of practice and of aging in advanced gerontological nursing. Analysis of central health problems and nursing strategies relevant to older people. *(Practicum) Pre: 501, 502, and credit or concurrent enrollment in 561. In alternate years. Next offered 1994–95.* Burbank

564 Advanced Clinical Study of Nursing Practice in Parent-Child Health *(I, 6)* Study and application of normal developmental and biopsychosocial stress theories in advanced clinical parent-child health nursing. Analysis of problems and nursing strategies relevant to parents and children. *(Practicum) Pre: 501, 502, and credit or concurrent enrollment in 561. In alternate years. Next offered 1994–95.* Hirsch and McGrath

569 Theoretical Study of Advanced Nursing *(I, 3)* Theoretical foundations of advanced nursing practice. Emphasis is on the reciprocal nature of the relationship between theories, client problems, and nursing strategies in the areas of advanced practice. *(Seminar) Pre: 507, 521, 522, and concurrent enrollment in 562, 563, or 564, or permission of instructor. First offered fall 1994.* Staff

571 Theoretical Study of Well Women's Health Care *(II, 3)* A study of major theories, client issues, and nurse-midwifery strategies used in the care of well women seeking gynecological health care. *(Seminar) Pre: 501, 502, and concurrent enrollment in 572.* Staff

572 Practicum: Theoretical Study of Well Women's Health Care *(II, 3)* Clinical application of the theoretical knowledge and interventions in the care of well women in ambulatory health care settings. *(Practicum) Pre: concurrent enrollment in 571.* Staff

573 Theoretical Study of the Childbearing Woman and Her Family *(II, 3)* Within a systems perspective, theories are utilized to examine client issues related to the normal childbirth experience. Knowledge and skills relevant to nurse-midwifery strategies of normal childbirth are emphasized. *(Seminar) Pre: credit or concurrent enrollment in 571, 572; concurrent enrollment in 574.* Staff

574 Practicum: Theoretical Study of the Childbearing Woman and Her Family *(II, 3)* Theoretical application of nurse-midwifery strategies during the normal childbirth experience. Knowledge and skills relevant to patient care are emphasized. *(Practicum) Pre: concurrent enrollment in 573.* Staff

575 Advanced Practice: Collaborative Nurse-Midwifery *(I, 3)* Within a systems perspective, theories are utilized to examine client issues of the at-risk childbirth experience. Expanded nurse-midwifery strategies related to collaborative practice within the community are emphasized. *(Seminar) Pre: concurrent enrollment in 576.* Staff

576 Advanced Practice: Collaborative Nurse-Midwifery Practicum *(I, 6)* Field study of the clinical application of theoretical knowledge and skills in the at-risk childbirth experience. Use of collaborative practice and the management process within communities is emphasized. *(Practicum) Pre: concurrent enrollment in 575.* Staff

577 Practice and Integration of Nurse-Midwifery *(I or II, 5)* Comprehensive and practical application of clinical skills and theoretical knowledge in nurse-midwifery. Complete integration of the nurse-midwifery role with the client, family, and community. *(Practicum) Pre: 575 and 576.* Staff

590 Directed Study and Practice in Advanced Clinical Nursing *(I or II, 3)* In-depth study and supervised clinical practice in a specialized area of nursing. *(Independent Study) Pre: graduate standing and permission of graduate faculty.* Staff

601 Foundations of Nursing Science *(II, 3)* Analysis of the nature of nursing knowledge from the historical and epistemological perspectives. Focus on examination of theoretical, ethical, and methodological foundations of the development of nursing science. *(Seminar) Pre: enrollment in the Ph.D. program in nursing.* Kim

602 Construction of Nursing Theory I: Inductive Process *(II, 4)* Study of inductive approaches to generating theory relevant to nursing science. Examination of multidisciplinary strategies for generation of theory from field data. *(Seminar) Pre: enrollment in the Ph.D. program in nursing, 601, or permission of instructor.* Schwartz-Barcott

603 Construction of Nursing Theory II: Deductive Process *(I, 3)* Study of deductive theory-building as applied to nursing science. Focus on the nature of deductive theories and the application of deductive process to nursing theory construction. *(Seminar) Pre: enrollment in the Ph.D. program in nursing, 601, or permission of instructor.* Kim

621 Nursing Theory and Research in the Client Domain *(I, 3)* In-depth, comparative analysis of existing nursing theories and research relevant to the client domain. Development of a research proposal for validation of a selected nursing theory. *(Seminar) Pre: doctoral standing in nursing and completion of core courses in nursing.* Schwartz-Barcott

631 Nursing Theory and Research in the Client-Nurse Domain *(I or II, 3)* Study of theoretical and research work in the client-nurse domain. Formulation and testing of hypotheses dealing with client-nurse phenomena. *(Seminar) Pre: doctoral standing in nursing and completion of core courses in nursing.* Kim

641 Nursing Theory and Research in the Practice Domain *(I, 3)* In-depth analysis of theoretical and research work in the nursing domain of practice. The expansion and refinement of knowledge for nurse-system phenomena of the practice domain. *(Seminar) Pre: doctoral standing in nursing and completion of core courses in nursing.* Kim

651 Advanced Methods in Nursing Research I *(I, 3)* In-depth study of theories and methods in sampling, research design, data collection, and data analysis, and their application to qualitative research in nursing. Emphasis on qualitative data collection methods. *(Seminar) Pre: enrollment in the Ph.D. program in nursing, advanced statistics course, or permission of instructor.* Fortin

652 Advanced Methods in Nursing Research II *(II, 3)* In-depth study of application of theories and methods in sampling, research design, data collection, data analysis for quantitative and evaluative research in nursing. *(Seminar) Pre: enrollment in the Ph.D. program in nursing, 651, or permission of instructor.* Fortin

653 Measurement and Instrument Development in Nursing Research *(II, 3)* In-depth study of theories and methods relevant to measurement and instrument development for nursing and health sciences. Emphasis on measurement as an ongoing process of successive approximation, refinement, and validation. *(Seminar) Pre: completion of 652 or permission of instructor.* Fortin

660 Philosophical Foundations for Health Care Research *(I, 3)* Presentation of the historical and philosophical basis of contemporary health care research. *(Seminar) Pre: enrollment in the Ph.D. program in nursing.* Burbank

671 Role Development in Nursing Research *(II, 3)* In-depth examination of the role of the nurse researcher as a member of a multidisciplinary team and in academia. Emphasis on theories and issues related to researcher role development. *(Seminar) Pre: doctoral standing in nursing, 601, 602 or 603, and 660.* Joseph and McGrath

699 Doctoral Dissertation Research *(I or II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

995 Reading and Research in Nursing *(I or II, 1–6)* Advanced work by individual student on a selected issue in nursing under the direction of a faculty member. *(Independent Study) Pre: graduate standing. S/U credit.* Staff

NUR Courses
Nursing

459 Perspectives on Male and Female Sexuality *(I or II, 3)*

501 Theoretical Study of Phenomena in Nursing *(I, 3)* Major theories and concepts in nursing. Emphasis on the theoretical study of nursing phenomena commonly found in client and client-nurse systems. *(Seminar) Pre: enrollment in the M.S. program in nursing and concurrent enrollment in 502.* Beck, Dufault, and Schmieding

502 Practicum in the Study of Phenomena in Nursing *(I, 3)* Field study of selected nursing phenomena in health care agencies. Emphasis on the clinical application of selected theoretical or conceptual frameworks. *(Practicum) Pre: enrollment in the M.S. program in nursing and concurrent enrollment in 501.* Beck, Dufault, and Schmieding

503 Expanded Nursing Assessment Skills *(I and II, 3)* Expansion of nursing assessment skills including health history taking and physical, psychological, and social assessment skills. Specific physical assessment skills included are inspection, auscultation, percussion, and palpation. *(Lec. 2, Lab. 1) Pre: enrollment in the M.S. program in nursing.* Fimbel-Coppa and Sweat-Carley

504 Expanded Nursing Assessment Skills: Pediatrics *(I, 1)* Application of expanded nursing assessment skills to children. Includes assessment of growth and development, psychosocial, cognitive, and physical well-being of children of all age groups. *(Lec. 1) Pre: credit or concurrent enrollment in 503 or permission of instructor.* Fimbel-Coppa or McGrath

505 Nursing Research *(I or II, 3)* An overview and analysis of current research in nursing with special focus on patient care. Students will design a research project. *(Seminar) Pre: a course in statistics, credit or concurrent enrollment in 501, 502, or permission of instructor.* Fortin, Kim, or Yeaw

506 Independent Study in Nursing *(I and II, 2–6)* Intensive study of a specific area of interest, a problem or issue in nursing under guidance of the faculty. *(Independent Study) Pre: permission of graduate faculty.* Staff

507 Theories of Practice for Nursing *(II, 3)* Analysis of general theories of practice for nursing and their applicability to various areas of clinical practice. *(Seminar) Pre: 501, 502, or permission of instructor.* Hirsch or Burbank

510 Nursing Leadership in the Health Policy Process *(II, 3)* Study of nurses' participation in the health policy process. Focus on theories for the development of nursing leaders. Analysis and application of creative nursing strategies for the enhancement of health care. *(Seminar) Pre: enrollment in the M.S. program in nursing.* Hirsch or Schmieding

511 Advanced Mental Health Nursing I *(II, 3)* Investigation of theories of healthy and psychopathological patterns of individual behavior from a mental health perspective. *(Seminar) Pre: 501 and 502 and credit or concurrent enrollment in 512.* Garey

512 Practicum in Advanced Mental Health Nursing I *(II, 3)* Field experience to develop competence in the practice of advanced mental health nursing. Emphasis on application of relevant theories in solving individuals' mental health problems. *(Practicum) Pre: 501 and 502 and concurrent enrollment in 511.* Garey

513 Advanced Mental Health Nursing II *(I, 3)* Theoretical analysis of current modes of advanced mental health intervention in order to explain strategies for solution of family, group, and community problems. *(Seminar) Pre: 511, 512, and concurrent enrollment in 514.* Garey

514 Practicum in Advanced Mental Health Nursing II *(I, 6)* Field experience to develop increased competence in the practice of mental health nursing intervention. *(Practicum) Pre: 511, 512, and concurrent enrollment in 513.* Garey

520 Graduate Study Seminar *(I or II, 1)* A seminar designed to facilitate the synthesis and examination of information learned in the master's program about nursing knowledge development, advancement of nursing practice, and leadership role development. *(Seminar) Pre: completion of 30 graduate program credits and concurrent enrollment in the final sequence of concentration courses.* Schmieding and Beck

521 Theoretical Study of Major Problems in Nursing Practice *(II, 3)* Major theories and concepts for developing strategies in nursing practice. Emphasis on developing nursing strategies through theoretical analysis of problems viewed in the context of organizational and societal systems. *(Seminar) Pre: 501, 502, and concurrent enrollment in 522.* Dufault

522 Practicum in the Study of Major Problems in Nursing Practice *(II, 3)* Field study of major nursing problems with emphasis on examination, evaluation, and revision of nursing strategies for problems in the context of organizational and societal systems. *(Practicum) Pre: 501, 502, and concurrent enrollment in 521.* Dufault

531 Primary Health Care Nursing I *(II, 3)* Theoretical knowledge and skills for the development of nursing strategies in analyzing, managing, and preventing health-related problems common to primary health care clients. *(Seminar) Pre: 501, 502, 503, and ZOO 442.* Fimbel-Coppa and Sweat-Carley

532 Practicum in Primary Health Care Nursing I *(II, 3)* Clinical application of theoretical knowledge and skills as presented in 531. *(Practicum) Pre: concurrent enrollment in 531.* Fimbel-Coppa and Sweat-Carley

533 Primary Health Care Nursing II *(I, 3)* Theoretical study for the development of increased nursing competency in primary care practice. Emphasis on health care strategies to assist individuals and families in coping with health-related problems. *(Seminar) Pre: 531, 532, and concurrent enrollment in 534.* Fimbel-Coppa and Sweat-Carley

534 Practicum in Primary Health Care Nursing II *(I, 6)* Application of theoretical knowledge and skills for the development of nursing strategies for health promotion and management of health-related problems common to families. *(Practicum) Pre: 531, 532, and concurrent enrollment in 533.* Fimbel-Coppa and Sweat-Carley

541 Theoretical Study of Nursing Education *(I, 3)* Investigation of theories, concepts, and models applicable to nursing education. Emphasis on theoretical analysis to develop and explain strategies for the teaching of nursing. *(Seminar) Pre: 521, 522, permission of instructor, and concurrent enrollment in 542. In alternate years. Next offered 1995–96.* Hirsch

542 Practicum in Nursing Education *(I, 6)* Field experience in nursing education. Emphasis on the instructional design and the development of strategies for the teaching of nursing based on theoretical knowledge. *(Practicum) Pre: 521, 522, or permission of instructor, and concurrent enrollment in 541. In alternate years. Next offered 1995–96.* Hirsch

551 Theoretical Study of Nursing Administration *(I, 3)* Study of relation of nursing philosophy, organizational theories, and practice environment to nursing administration. Emphasis on theories, concepts, and issues that explain and advance strategies in nursing administration. *(Seminar) Pre: 521, 522, or permission of instructor, and concurrent enrollment in 552. In alternate years. Next offered 1995–96.* Schmieding

552 Practicum in Nursing Administration *(I, 6)* Field experience in nursing administration. Emphasis on role development and the examination, development, and implementation of strategies in nursing administration. *(Practicum) Pre: 521, 522, or permission of instructor, and concurrent enrollment in 551. In alternate years. Next offered 1995–96.* Schmieding

560 Ethical Theories, Nursing Practice, and Health Care *(I or II, 3)* Analysis of philosophic positions, ethical theories, and moral principles important to professional nurses in their clinical, educative, and administrative practice. *(Seminar) Pre: B.S. or B.A. in a health-related field, one course in philosophy and ethics, or permission of instructor.* Staff

561 Theories of Practice for Clinical Nursing *(I, 3)* Intensive analysis of theories of practice as applied to clinical nursing. Emphasis on theoretical knowledge of the nurse system phenomena in professional clinical nursing. *(Seminar) Pre: 501, 502, 521, and 522, and concurrent enrollment in 562, 563, or 564. In alternate years. Next offered 1994–95.* Hirsch

532 Conservation Biology *(II, 2)* Examination of the different components of conservation of biological diversity. Topics include genetics of small populations, minimum viable population sizes, captive propagation reintroduction ecology, and causes of extinction. *(Lec. 2) Pre: BOT (or ZOO) 262 or permission of instructor. In alternate years. Next offered spring 1996.* August

534 Ecology of Fragmented Landscapes *(II, 2)* Presentation of the concepts of landscape ecology with emphasis on populations of plants and animals in fragmented habitats. Topics discussed include: habitat corridors, fluxes of energy and species along habitat edges, shape analysis, and stability of populations in habitat patches. *(Lec. 2) Pre: BOT (or ZOO) 262 or permission of instructor. In alternate years. Next offered spring 1995.* August

555 Applied Coastal Ecology *(I, 2)* Resource management problems in coastal national parks. Topics include air and water pollution, barrier island erosion, deer overpopulation, Lyme disease, and ecosystem restoration. Examples of conflicting land-management mandates and research needs discussed. Optional field trips. *(Lec. 2) Pre: advanced course work or experience in topical fields or permission of instructor. Offered in even-numbered years.* Buckley, Ginsberg, and Roman

567 Soil Genesis and Classification *(II, 3)* Development of soils as influenced by physical, chemical, biological, and climatic factors. Processes of soil formation presented relative to soil taxonomy and geographic distribution. *(Lec. 3) Pre: 471 or permission of instructor.* Wright

568 Recent Advances in Natural Resources Science *(I, 3)* Critical analysis and presentation of technical reports on recent advances in natural resources science. Topics will vary according to instructor and background of students. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years. Next offered 1995–96.* Staff

591, 592 Special Problems *(I and II, 1–3 each)* Advanced independent research projects supervised by members of the research staff and unrelated to thesis research. Projects developed to meet individual needs. *(Independent Study) Pre: permission of chairperson.* Staff

599 Master's Thesis Research I, II *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

699 Doctoral Dissertation Research I, II *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Nursing

M.S., Ph.D.
401-792-2766

Graduate Faculty

Dean: Professor Jean Miller, R.N., Ph.D., 1975, University of Washington
Assistant Dean: Associate Professor Dayle Hunt Joseph, R.N., Ed.D., 1982, Boston University
Director of Graduate Studies: Professor Donna Schwartz-Barcott, R.N., Ph.D., 1978, University of North Carolina
Professor Janet I. Hirsch, R.N., Ed.D., 1978, Boston University
Professor Hesook S. Kim, R.N., Ph.D., 1977, Brown University
Professor Norma Jean Schmieding, R.N., Ed.D., 1983, Boston University
Associate Professor Cheryl Beck, R.N., D.N.Sc., 1982, Boston University
Associate Professor Jacqueline D. Fortin, R.N., D.N.Sc., 1984, Boston University
Associate Professor Marion Garey, R.N., Ed.D., 1985, Boston University
Associate Professor Margaret McGrath, R.N., D.N.Sc., 1988, Boston University
Associate Professor Evelyn Yeaw, R.N., Ph.D., 1983, Boston College
Assistant Professor Patricia M. Burbank, R.N., D.N.Sc., 1988, Boston University
Assistant Professor Marlene A. Dufault, Ph.D., 1983, University of Connecticut
Assistant Professor John Twomey, R.N., Ph.D., 1993, University of Virginia
Adjunct Assistant Professor Holly Powell Kennedy, R.N., M.S., 1978, Medical College of Georgia
Clinical Assistant Professor Denise Fimbel-Coppa, R.N., M.S., 1979, University of Colorado

Specializations

For the M.S.: education, administration, mental health care, primary health care, clinical practice (with emphasis on critical care, gerontological nursing, or parent-child nursing), and nurse-midwifery.

For the Ph.D.: clinical nursing research in the domains of client, client-nurse interactions, and nursing practice.

Master of Science

Admission requirements: MAT or GRE; a bachelor's degree from an NLN-accredited program with an upper-division major in nursing and an undergraduate course in statistics. For specialization in primary health care—two years of professional nursing practice. For specialization in midwifery—two years of professional nursing practice in maternity and completion of a course in expanded assessment skills in nursing, including newborn and pediatric assessment and equivalent of NUR 503 and 504. Students who have not completed upper-division undergraduate nursing course work will be required to make up this deficiency prior to admission. Completed application package must be received by November 15 for spring admission and April 15 for summer and fall admission. Acceptance is based on a full review of the applicant's record and not on any one single component.

Program requirements: 40 credits for education, administration, mental health, and clinical practice specialization; 41 credits for primary health care specialization; 45 credits for midwifery concentration, including 16 credits in core courses—NUR 501, 502, 505, 507, 510, and 520; 15–26 credits in the area of specialization—NUR 521, 522, 541, 542 for education; NUR 521, 522, 551, 552 for administration; NUR 511, 512, 513, 514 for mental health care; NUR 531, 532, 533, 534 for primary health care; NUR 521, 522, 569, and 562 or 563 or 564 for clinical practice; and NUR 571, 572, 573, 574, 575, 576, 577 for midwifery; nine credits of restricted electives related to the area of specialization, except for midwifery, which requires three credits, and primary health care, which requires 10 credits, including ZOO 442 or equivalent, NUR 503 and 504, and three credits of electives related to the area of specialization; a major paper involving significant independent study; and a written comprehensive examination.

Doctor of Philosophy

Admission requirements: GRE (scores at 60th percentile or above are desirable); a bachelor's degree from an NLN-accredited program or its equivalent in nursing and a master's degree in nursing or its equivalent (cumulative averages of 3.00 and 3.30, respectively, are desirable); two scholarly papers (one theoretical and one empirical) or a master's thesis or equivalent; three recommendations for doctoral study including one by a doctorally prepared person; a statement of purpose indicating goals congruent with those of the program and institution; and a course in statistics including inferential statistics. Acceptance is based on a full review of the applicant's record and not on any one single component.

Program requirements: a minimum of 61 credits including core courses in nursing (19 credits) and cognates (six credits); electives in nursing (six credits) and research methods (six credits); free electives (six credits); and the doctoral dissertation (at least 18 credits), plus written and oral comprehensive exams in nursing theory, research methods, and one substantive area.

595 Concert Choir *(I and II, 0–1) (Rehearsal 3) Pre: audition at graduate level of performance.* Saladino

596 Jazz and Studio Ensemble *(I and II, 0–1)* Study and performance of jazz and studio music, with leadership roles in improvisation and performance. *(Rehearsal 3) Pre: audition at graduate level of performance.* Staff

597 University Symphony *(I and II, 0–1) (Rehearsal 3) Pre: audition at graduate level of performance. May be repeated.* Staff

598 Chamber Music Ensemble *(I and II, 0–1)* Chamber music ensembles are designated as

K	Keyboard Ensemble	V	Vocal Ensemble
S	String Ensemble	G	Guitar Ensemble
W	Woodwind Ensemble	J	Jazz Ensemble
B	Brass Ensemble	M	Mixed Ensemble
P	Percussion Ensemble	O	Opera Workshop

Select appropriate letter and small ensemble from the list and add to course number, as 598S String Ensemble. Other ensemble combinations may be added. Small instrumental ensembles are normally restricted to one performer per part. *(Rehearsal 2) Pre: graduate standing in music and evidence by audition of graduate-level performance. May be repeated.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) Pre: 548. May be repeated. S/U credit.* Staff

Natural Resources

M.S., Ph.D. (Biological Sciences)
401-792-2370

Graduate Faculty

Chairperson: Professor William R. Wright, Ph.D., 1972, University of Maryland
Director of Graduate Studies: Associate Professor Peter August, Ph.D., 1981, Boston University
Professor James H. Brown, Jr., D.F., 1965, Duke University
Professor Victor Cabelli, Ph.D., 1951, University of California, Los Angeles
Professor Arthur J. Gold, Ph.D., 1983, Michigan State University
Professor Francis C. Golet, Ph.D., 1973, University of Massachusetts
Professor Thomas P. Husband, Ph.D., 1977, Michigan State University
Professor Robert H. Miller, Ph.D., 1964, University of Minnesota
Associate Professor William R. Eddleman, Ph.D., 1983, Oklahoma State University
Assistant Professor José A. Amador, Ph.D., 1990, Cornell University
Assistant Professor Amy Gamerdinger, Ph.D., 1989, Cornell University
Adjunct Professor P.A. Buckley, Ph.D., 1966, Cornell University
Adjunct Associate Professor Peter M. Groffman, Ph.D., 1984, University of Georgia
Adjunct Assistant Professor Vernon C. Bleich, Ph.D., 1992, University of Alaska, Fairbanks
Adjunct Assistant Professor Josef H. Gorres, Ph.D., 1983, University of Manchester
Adjunct Assistant Professor Mark C. Wallace, Ph.D., 1991, University of Arizona

Specializations

Soil chemistry, soil biochemistry, soil genesis and classification, soil fertility and management, soil properties and land use, organic geochemistry, water resources management, avian and mammalian ecology, wetland ecology, forest science, wildlife habitat analysis, wildlife management.

Master of Science

Admission requirements: GRE and bachelor's degree with undergraduate major in biological or physical sciences. Applicants with course deficiencies may be required to take appropriate undergraduate courses in the basic sciences without program credit.

Program requirements: thesis option—thesis and 24 credits including NRS 500. Nonthesis option—permission of chairperson, 36 credits with a minimum of 14 credits in natural resources science to include NRS 500 and 591, three credits in statistics, and a written master's examination. NRS 591 will require a substantial paper involving significant independent research. Additional prerequisite courses in the basic sciences may be required prior to admission to a degree program.

Doctor of Philosophy (Biological Sciences)

Limited to soil science and organic geochemistry specializations.

Admission requirements: GRE and M.S. degree with thesis in biological or physical science.

Program requirements: dissertation, advanced courses determined in consultation with the candidate's committee, and comprehensive examination.

NRS Courses
Natural Resources Science

402 Wildlife Biometrics *(II, 3)*
406 Wetland Wildlife Management *(II, 3)*
407 Nongame and Endangered Species Management *(I, 3)*
410 GIS Methods in Environmental Management *(I, 3)*
412 Soil-Water Chemistry *(II, 3)*
423 Wetland Ecology *(I, 4)*
424 Wetlands and Land Use *(II, 4)*
450 Soil Conservation and Land Use *(I, 3)*
451 Soil and Water Conservation Technology *(I, 3)*
461 Hydrology and Water Management *(I, 4)*
471 Soil Morphology and Mapping *(I, 3)*
475 (or PLS 475) Plant Nutrition and Soil Fertility *(II, 4)*
491, 492 Special Projects *(I and II, 1–3 each)*

500 Graduate Seminar in Natural Resources *(II, 1)* Presentation of research reports and discussion of current topics in natural resources. Critique of research methodology and scientific literature. *(Seminar) Pre: graduate standing. Attendance is required of all graduate students in residence, but no more than 2 credits may be taken for program credit. S/U credit.* Staff

505 Biology of Management of Migratory Birds *(I, 2)* Current programs, problems, and techniques for managing migratory game and nongame birds. Emphasis on basic biology of the species, habitat management, and harvest management. *(Seminar) Pre: 305 or permission of instructor. In alternate years. Next offered 1995–96.* Eddleman

509 Concepts of GIS and Applications in Environmental Science *(I, 3)* Unique properties of spatial data, geographic information system (GIS) data structures, accessing existing spatial data, and applications of GIS in the environmental sciences. Uses in ecology, conservation, soil science, geohydrology, and wildlife management. *(Lec. 3) Pre: ZOO 262 or permission of instructor.* August

510 Soil-Water Relations *(II, 3)* Processes governing water flow and availability in unsaturated and saturated soil. Emphasis on soil-water-plant relationships with applications to watershed management and hydrology. *(Lec. 2, Lab. 3) Pre: 212, 461, or permission of instructor.* Gold

514 Fate of Organic Chemicals in Soils and Sediments *(II, 3)* Physical and chemical processes which determine contaminant distribution in soils and sediments, along with mechanistic conceptual models of these processes. Soil-water-contaminant relationships are emphasized. *(Lec. 3) Pre: one semester of organic chemistry and permission of instructor.* Gamerdinger

522 Advanced GIS Analysis of Environmental Data *(II, 3)* Discussion and applications of terrain modeling, spatial statistics, proximity analysis, remote sensing/GIS linkages, and environmental data integration. Emphasis on ecological data at watershed/landscape scales. *(Lec. 1, Lab. 6) Pre: 410 or permission of instructor.* August

523 Water Pollution Microbiology
See Microbiology 523.

526 Microbial Ecology of Soils and Sediments *(I, 3)* Occurrence and activity of microorganisms in soils and sediments, including wetlands. Environmental physiology of microbes; habitat interactions; methods of study; importance of microbial processes to ecosystem productivity, pollutant degradation, and atmospheric chemistry. *(Lec. 3) Pre: 212, MIC 211, or permission of instructor.* Amador

MUSIC EDUCATION SPECIALIZATION

MUS 540, 545, 548, 579, 580, 581, and nine credits in one of the following subject areas. *Performance/essay:* six credits of MUS 510 (2 + 2 + 2 or 3 + 3 credits), 550, and 570. *Conducting:* MUS 511, 512, and 513. *Composition (Classical or Studio):* six credits of MUS 510V (2 + 2 + 2 or 3 + 3), 511 or 512 and 552. Additional credits recommended for studio composition are MUS 579 in a professional recording studio, 596, or 598J. *Thesis:* at least six credits in MUS 599 and three elective credits. All music education candidates must also take a minimum of nine credits of electives from music history, theory/composition, and performance (no more than six credits in any one of these three areas, and performance only if it is not already part of the specialization). Students in a thesis program must pass a written qualifying examination before thesis work is begun and defend the thesis in a final oral examination. All other music education candidates must pass a written comprehensive examination in music history, theory, and music education.

MUS Courses
Music

407 The Symphony *(I, 3)*
408 The Opera *(II, 3)*
410 (461) Applied Music *(I and II, 2–4)*
420 Eighteenth-Century Counterpoint *(II, 3)*
421 Electronic and Computer Music Research *(I, 3)*
424 (306) Jazz Composition and Arranging *(I, 3)*
430 The Renaissance Era *(II, 3)*
431 The Baroque Era *(II, 3)*
432 The Classical Era *(I, 3)*
433 The Romantic Era *(I, 3)*
434 The Modern Era *(I, 3)*
442 Directed Study in Applied Music Pedagogy *(I and II, 2)*
450 (455) Senior Recital *(I or II, 0)*
470 (438) Special Topics in Music *(II, 1–3)*
480 Graduation Portfolio in Music *(I and II, 0–2)*
490 Independent Study *(I and II, 1–3)*

510 (561) Applied Music *(I and II, 1, 2, 3, 4, or 6)* Private instruction. One 60-minute lesson each week.* Levels, master classes, and recital performance as prescribed in the applied music syllabi *(Studio 60 minutes) Pre: audition demonstrating proficiency appropriate to the selected M.M. degree. May be repeated.* Staff

A Voice	I Flute	Q Euphonium/ Baritone
B Piano	J Oboe	R Tuba
C Organ	K Clarinet	S Percussion
D Harpsichord	L Bassoon	T Guitar
E Violin	M Saxophone	U Harp
F Viola	N Trumpet	V Composition
G Violoncello	O French Horn	
H Contra Bass	P Trombone	

511 Advanced Choral Conducting *(II, 3)* Critical study of choral music scores with reference to interpretation and performance. Development of technical command and expressive skills includes supervised rehearsal and conducting of University ensembles. *(Lec. 3) Pre: knowledge of conducting technique as evidenced in audition or 311.* Saladino

512 Advanced Instrumental Conducting *(I, 3)* Critical study of orchestral and chamber music scores with reference to interpretation and performance. Development of technical command and expressive skill includes supervised rehearsal and conducting of University ensembles. *(Lec. 3) Pre: knowledge of basic baton as evidenced in audition or credit in 312. In alternate years. Next offered fall 1994.* Staff

513 Graduate Conducting Project *(I and II, 3)* Preparation and conducting of a program of chamber music and/or a major ensemble with documentation. *(Studio 3) Pre: 511, 512, and 548 and permission of chairperson.* Staff

540 Foundations of Music Education *(II, 3)* Examination of the broad influences upon music education. Historical, philosophical, sociological, psychological, and curricular foundations. *(Lec. 3) Pre: graduate standing in music. In alternate years. Next offered spring 1996.* Livingston and Pollart

545 Musical Learning, Evaluation and Assessment *(I, 3)* A study of cognitive, psychomotor, and affective learning in music. The ways in which musical learning may be evaluated and assessed. The needs of special populations will be included. *(Lec. 3) Pre: graduate standing in music.* Livingston

548 Research in Music *(II, 3)* Study of research techniques as applied to the art of music. Major project procedures and data collection and examination in the following research categories: historical, philosophical, and empirical. *(Lec. 3) Pre: graduate standing in music. In alternate years. Next offered spring 1995.* Lee

550 (565) Graduate Performance Recital *(I and II, 0)* Performance of advanced repertoire of various styles in a public program at least 55 minutes in duration for the M.M. in performance and 45 minutes in duration for the M.M. in music education after faculty acceptance. *(Studio) Pre: concurrent enrollment in 510 and 6 or more credits in 510 for the M.M. in performance or 4 or more credits in 510 for the M.M. in music education.*

552 Graduate Composition Recital *(I and II, 0)* A juried recital of at least 40 minutes of original compositions prepared by the composer. *(Studio) Pre: concurrent enrollment in 510V and 3 or more credits in 510V.* Staff

567 Seminar in Performance and Pedagogy *(II, 2)* Study of performance literature, practice, and pedagogy. Research projects and supervised teaching experience appropriate to the major performance area. *(Lec. 2) Pre: concurrent enrollment in 551 or 561. In alternate years. Next offered spring 1995.* Gibbs

570 Graduate Project *(I and II, 3)* Independent study resulting in a major essay, composition, or orchestration. *(Independent Study) Pre: 548 and permission of chairperson.* Staff

571 (538) Special Topics in Music *(I or II, 1–3)* Exploration of advanced topics not covered by the standard curriculum but of interest to faculty and students in a particular semester. Topics in performance, music history, music theory and composition, and music education. *(Lec. 1–3) May be repeated for credit with a different topic.* Staff

579 Experiential Learning in Music *(I or II, 2)* Developing competence through an individual and/or collaborative experiential activity involving music research, performance, service, and/or teaching in university and community settings. May include professional music studio or computer lab work. Student will work with his or her major professor or with the Director of Graduate Studies. *(Practicum) Pre: graduate standing and previous or concurrent enrollment in 580.* Staff

580 Master of Music Portfolio I *(I or II, 0)* Planning individual activities and experiences demonstrating competence at the graduate level in music. Should be taken in the first semester of matriculation. Student will work with his or her major professor or with the Director of Graduate Studies. *(3 common Seminars) Pre: graduate standing in music.* Staff

581 Master of Music Portfolio II *(I or II, 1)* Individual accomplishment of activities and experiences demonstrating competence at the graduate level of music. Achievement of professional behaviors indicating significant growth in areas of specialization. Oral presentation required. Should be taken in final semester of study. Student will work with his or her major professor or with the Director of Graduate Studies. *(3 common Seminars) Pre: graduate standing in music.* Staff

583 Vocal Diction *(I, 3)* Phonetics (International Phonetic Alphabet). Enunciation in the foreign languages most encountered in vocal literature (French, Italian, and German). English diction in singing. *(Lec. 3) In alternate years. Next offered fall 1995.* Staff

590 Piano Accompanying *(I and II, 1)* Development of sightreading skills. Preparation and performance of accompaniments of major works. *(Studio 1) Pre: permission of piano faculty. May be repeated for a maximum of 3 credits.* Rankin

593 University Chorus *(I and II, 0–1) (Rehearsal 3) Pre: audition at graduate level of performance. May be repeated.* Saladino

594 Symphonic Wind Ensemble *(I and II, 0–1) (Rehearsal 3) Pre: audition at graduate level of performance.* Pollart

* Supplementary fee required for all areas of applied music except composition: $95 for one credit; $190 for two, three, four, or six credits.

533 Immunology *(II, 3)* Introduction to the cellular, molecular, and genetic basis of the immune system, and the role of the immune system in immunity to infection, tumor and transplantation immunobiology, and immunopathology. *(Lec. 3) Pre: 201 or 211.* Laux

534 Animal Virology
See Aquacultural Science and Pathology 534.

536 Virology Laboratory
See Aquacultural Science and Pathology 536.

538 Epidemiology of Viral and Rickettsial Diseases
See Aquacultural Science and Pathology 538.

552 (or BCH 552) Microbial Genetics *(II, 3)* Recent research on the mechanism of mutation, genetic recombination, the genetic code, transposons, regulations, genetic engineering and regulation of DNA, RNA, and protein synthesis in microbial systems. *(Lec. 3) Pre: 201, BOT 352, and BCH 311.* Cohen

561 Recent Advances in Molecular Cloning *(I or II, 1)* Reports of readings concerning the latest developments in techniques of molecular cloning and their applications in the study of various biological systems. *(Lec. 1) Pre: 552 or permission of instructor. May be repeated.* Nelson

571 Insect Microbiology
See Entomology 571.

576 Marine Microbiology
See Oceanography 576.

593, 594 The Literature of Bacteriology *(I and II, 1 each)* Thorough study of original literature of some phase of bacteriology. Written abstracts or papers on assigned topics are discussed in weekly conferences with instructor. *(Independent Study)* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

622 (or BCH 622) Advanced Electron Microscopy *(II, 2)* The physical functioning of electron microscopes; high resolution microscopy of macromolecules; newly available EM histochemical procedures; and computer processing of electron images. *(Lec. 2) Pre: 403, 405, or permission of chairperson.* Hufnagel

624 (or BCH 624) Advanced Electron Microscopy Laboratory *(II, 2)* Cleaning and aligning the electron microscope; development of independent project utilizing advanced techniques, and formal presentation of results of individual projects to the class. *(Lab. 6) Pre: credit or concurrent enrollment in 622 or permission of chairperson.* Hufnagel

641 Physiology of Bacteria *(II, 3)* Bacterial structure and function, including growth, nutrition, environmental factors, metabolism, biosynthesis, and energy-yielding reactions. *(Lec. 3) Pre: 413 and 415. In alternate years. Next offered 1995–96.* Wood

654 Advances in Immunology *(II, 2)* Reports on assigned readings concerning latest developments in the field of cellular and humoral immunity presented and discussed by students. Research paper and critical review of a scientific paper required. *(Lec. 2) Pre: 533, BCH 311, or permission of instructor. May be repeated for a maximum of 4 credits. In alternate years. Next offered 1995–96.* Laux

656 Mechanisms of Bacterial Pathogenesis *(I, 3)* Study of recent research on the molecular mechanisms of pathogenesis. Students expected to participate in roundtable discussions of recent pertinent literature. *(Lec. 3) Pre: 432, 552, and BCH 311. In alternate years. Next offered 1995–96.* Staff

691, 692 Special Problems in Microbiology *(I and II, 3 each)* Assigned research on an advanced level. Student required to outline problem, conduct the necessary literature and experimental work, and present observations and conclusions in a report. *(Independent Study) Pre: graduate standing.* Staff

695, 696 Graduate Research Seminar *(I and II, 1 each)* Reports of research in progress or completed. *(Seminar) Required of all graduate students in microbiology. S/U credit.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Microbiology Topics for Teachers *(I and II, 0–3 each)* Especially designed for teachers of biology. Basic topics of microbiology from an advanced or pedagogical perspective. *(Workshop)* Staff

Note: For Virology, see Aquacultural Science and Pathology and Plant Sciences. For Mycology, see Botany.

Music

M.M.
401-792-2431

Graduate Faculty

Chairperson: Professor Ronald T. Lee, Ph.D, 1970, University of Michigan
Coordinator of Graduate Studies: Professor Gene J. Pollart, M.M., 1967, University of Colorado
Professor John D. Dempsey, M.M., 1964, Eastman School of Music, University of Rochester
Professor Henry C. Fuchs, M.Mus., 1961, University of Michigan
Professor Geoffrey D. Gibbs, D.M.A., 1974, Eastman School of Music, University of Rochester
Professor George E. Kent, M.M., 1960, New England Conservatory of Music
Professor James Ladewig, Ph.D., 1978, University of California, Berkeley
Professor W. Donald Rankin, D.M.A., 1970, Boston University
Associate Professor Gary Glaze, M.M., 1962, University of Michigan
Associate Professor Carolyn Livingston, Ph.D., 1986, University of Florida
Associate Professor David Saladino, Ph.D., 1984, Florida State University

MASTER OF MUSIC

Specializations

Performance or music education.

Admission Requirements

Undergraduate major, or the equivalent, in music with a quality point average of 2.50 or above. Applicants for performance as a specialization, or for the performance/essay subspecialization under music education, must pass an audition in their major performance subject on tape or, preferably, in person, before acceptance into a program. Applicants for conducting as a specialization must pass an audition in choral or instrumental conducting, on videotape or, preferably, in person. Applicants for composition as a subspecialization must submit a portfolio of scores and/or tapes of original works.

Program Requirements

Post-admission placement examinations in appropriate areas (music history, theory, composition, and/or music education) determine whether background deficiencies must be made up with no program credit. A minimum of 30 credits is required for graduation. One-half of the program credits must be at the 500 level. (Teacher certification requires additional courses in education at the undergraduate level.)

PERFORMANCE SPECIALIZATION

Twelve credits of performance in MUS 510 (minimum of three in a semester) plus MUS 548, 550, 567, 580, 581, and three credits distributed according to the major performance subject, as follows. *For vocalists:* two credits in MUS 598 and music elective. Vocalists are also tested in foreign language diction and reading. *For pianists:* two credits in MUS 590 or 598 and music elective. *For organists and guitarists:* two credits in MUS 598 and music elective. *For other instrumentalists:* MUS 512 and ensemble elective. All performance candidates must also take a minimum of nine credits of electives from music history and theory/composition (no more than six credits in any one of these two areas), and pass a written comprehensive examination in music history, theory, and the performance major.

Microbiology

M.S., Ph.D. (Biological Sciences)
401-792-2205

Graduate Faculty

Chairperson and Director of Graduate Studies: Professor David C. Laux, Ph.D., 1971, University of Arizona
Professor Victor J. Cabelli, Ph.D., 1951, University of California, Los Angeles
Professor Paul S. Cohen, Ph.D., 1964, Boston University
Professor Karl A. Hartman, Ph.D., 1962, Massachusetts Institute of Technology
Professor Linda A. Hufnagel, Ph.D., 1967, University of Pennsylvania
Professor Richard W. Traxler, Ph.D., 1958, University of Texas
Professor George C. Tremblay, Ph.D., 1965, St. Louis University
Professor Norris P. Wood, Ph.D., 1955, University of Pennsylvania
Associate Professor Terence M. Bradley, Ph.D., 1983, University of Idaho
Associate Professor Joel M. Chandlee, Ph.D., 1984, North Carolina State University
Associate Professor Marian R. Goldsmith, Ph.D., 1970, University of Pennsylvania
Associate Professor William R. Krul, Ph.D., 1967, Purdue University
Asssociate Professor John P. Mottinger, Ph.D., 1968, Indiana University
Associate Professor David R. Nelson, Ph.D., 1979, University of California, Los Angeles
Associate Professor Dennis E. Rhoads, Ph.D., 1982, University of Cincinnati
Associate Professor Jay F. Sperry, Ph.D., 1974, University of Kansas
Assistant Professor Anthony S. Fischl, Ph.D., 1986, Rutgers—The State University
Assistant Professor Joanna Hanks Norris, Ph.D., 1982, Michigan State University

Specializations

Medical microbiology: pathogenesis, immunology, mycology, virology.

Microbial genetics, physiology, molecular microbiology: genetic and molecular relation of cellular morphogenesis and development, bacterial colonization of the mammalian intestine, messenger RNA metabolism in procaryotes and eucaryotes, virus multiplication, control of transport and metabolism, mechanisms of survival, membrane structure.

Cell biology, cellular development, ultrastructure: ciliogenesis in protozoa, electron microscopy, ultrastructure of electrically conducting systems, cell culture, cellular immunity.

Microbial ecology, industrial microbiology, pollution: marine and freshwater microbial ecology, biodeterioration, sanitary bacteriology, coliform ecology.

Master of Science

Admission requirements: GRE and two semesters each of biology (zoology, botany), general and organic chemistry, mathematics, calculus, and physics; a semester each of microbiology, genetics, quantitative analysis, biochemistry, and statistics. Applicants with deficiencies in these background courses may be required to complete appropriate course work without graduate credit.

Program requirements: thesis; BCH 581; MIC 413, 414, 415, 416, 599, 695, and 696; major portion of courses in microbiology, including one in virology, mycology, phycology, cell biology, or protozoology; written comprehensive examination.

Doctor of Philosophy (Biological Sciences)

Admission requirements: same as for master's degree. A course in physical chemistry is also recommended.

Program requirements: same as for master's degree plus BCH 582; MIC 533, 552, and dissertation. A course in microbial physiology (MIC 641, BOT 534, OCG 663 or equivalent). Of the credits earned beyond the master's degree, 18 should be in course work. Qualifying examination is required for students admitted without a master's degree. Prior to the last semester, the candidate must pass a written and oral comprehensive examination in the major areas of microbiology. Dissertation.

MIC Courses
Microbiology

401 (or BCH 401) Quantitative Cell Culture *(I, 3)*
403 (or BCH 403) Introduction to Electron Microscopy *(I, 2)*
405 (or BCH 405) Electron Microscopy Laboratory *(I, 2)*
412 Food Microbiology *(II, 3)*
413 Advanced Microbiology Lecture I *(I, 3)*
414 Advanced Microbiology Lecture II *(II, 3)*
415 Advanced Microbiology Laboratory I *(I, 2)*
416 Advanced Microbiology Laboratory II *(II, 2)*
421 (or BCH 421) Cell Biology and Cancer *(I, 3)*
422 (or FSN 422) Biotechnology of Industrial Microorganisms *(II, 3)*
432 Pathogenic Bacteriology *(II, 3)*
451 (or BCH 451 or BOT 451) Laboratory in Cell Biology *(II, 1)*
453 (or BCH 453 or BOT 453) Cell Biology *(II, 3)*
483 (or MTC 483) Introductory Diagnostic Microbiology *(I, 3)*
495, 496 Seminar in Microbiology *(I and II, 1 each)*

501 Advanced Clinical Microbiology I
See Medical Technology 501.

502 (or BCH 502) Techniques in Microbial and Molecular Genetics *(II, 2)* Techniques for the study of molecular genetics in bacteria and bacteriophages including mutant isolation, phage growth, transformation, transduction, conjugation, DNA isolation and analysis, and gene cloning. *(Lab. 6) Pre: 413 and 415 or BOT 437 or BOT 454 or BOT 522 or permission of instructor.* Nelson or Cohen

503 (or BCH 503) Electron Microscopy *(I, 2)* Biological specimen preparation techniques for transmission and scanning electron microscopy. Includes thin sectioning, negative staining, shadow-casting, freeze-etching, cytochemistry, principles of electron microscope operation. Final written and oral reports. *(Lec. 2) Pre: graduate standing or permission of instructor. Not open to students with credit in 403.* Hufnagel

505 (or BCH 505) Laboratory in Electron Microscopy *(I, 3)* Introduction to biological sample preparation for transmission and scanning electron microscopy. Tissue preparation, ultramicrotomy, operation of the electron microscope, darkroom procedures, particulate and molecular sample preparation, critical point drying, sputtercoating. Not open to students who have taken 405. *(Lab. 6) Pre: graduate standing or permission of instructor.* Hufnagel

513 Advanced Clinical Immunology
See Medical Technology 513.

514 The Electron Microscope in Molecular and Cellular Biology *(II, 2)* Use of the electron microscope to analyze structure and function of biological molecules. Applications in food science, pathology, pharmacology, ecology, gene engineering, and basic research. *(Lec. 2) Pre: BCH 311 and BOT 352 or permission of instructor. In alternate years. Next offered spring 1996.* Hufnagel

521 (or BOT 521 or ZOO 521) Recent Advances in Cell Biology *(I, 2)* Reading of current papers in the area of cell biology and preparation of written and oral reports. Emphasis on animal cells. *(Lec. 2) Pre: at least one of the following courses or an equivalent course emphasizing cell structure and function—ZOO 327, 421, BOT 432, 445, 453, and MIC 408; graduate standing or permission of instructor. May be repeated for a maximum of 4 credits.* Hufnagel

523 (or FSN 523 or NRS 523) Water Pollution Microbiology *(I, 3)* The microbiological aspects of water pollution, including the potential for infectious diseases, pollution effects on microbial ecosystems, and the microbial degradation of pollutants. *(Lec. 3) Pre: 201 or 211, BCH 311, or permission of instructor. Credit or concurrent enrollment in 525.* Cabelli and Traxler

525 (or FSN 525) Water Pollution Microbiology Laboratory *(I, 1)* Experimental method for pollution analysis, microbial indicator assay methods, microbial assays, sample collection and statistical treatment of data. *(Lab. 3) Pre: concurrent enrollment in 523 or permission of instructor.* Cabelli

compressible irrotational flows, and selected topics such as an introduction to non-Newtonian fluid behavior, geophysical flows, or numerical methods. *(Lec. 3) Pre: 551.* Lessmann and White

654 Fluid Mechanics III *(I, 3)* Two- and three-dimensional compressible flows, numerical methods for the solution of compressible and incompressible parabolic and elliptic problems. Other advanced topics of current interest. *(Lec. 3) Pre: 551.* Lessmann and White

666 Nonlinear Mechanics *(I and II, 3)* Dynamics of nonlinear systems, free and forced oscillations; graphical methods, integral curves, singular points, limit cycles and stability. Van der Pol equation, perturbation methods, approximate methods, application to ecological systems. *(Lec. 3) Pre: 564.* Staff

668 (or CVE 668) Theory of Shells *(I or II, 3)* Development of basic shell equations. Classical solution examples for membrane shells and shells of revolution with bending. Additional topics selected from variational methods, finite element techniques, reinforced and composite shells. *(Lec. 3) Pre: 568 or permission of instructor.* Sadd and Karamanlidis

671 Theory of Elasticity II *(II, 3)* Continuation of 571, including advanced topics selected from: complex variable methods; displacement potentials and stress functions for three-dimensional problems; thermoelasticity; variational, approximate, and numerical methods; anisotropic solutions. *(Lec. 3) Pre: 571.* Sadd and Taggart

678 Micromechanics *(II, 3)* Mechanics of material behavior from the microstructural viewpoint; mathematical modeling of inclusions, inhomogeneities, dislocations, granular and porous structures; constitutive equation development. Applications to metals, composites, ceramics, and other materials with microstructure. *(Lec. 3) Pre: 571, materials background of CHE 333 or higher.* Ghonem and Taggart

679 Theory of Plasticity *(II, 3)* Formulation and solution of inelastic material behavior, physical phenomena of yielding plastic flow, plastic stress-strain laws, yield criteria, plane problems, torsion, slip lines, limit analysis, creep. *(Lec. 3) Pre: 571 or permission of instructor.* Ghonem and Taggart

680 Advanced Topics in Solid Mechanics *(I or II, 3)* Advanced studies in the mechanics of solids with specific topics determined by current department interests. Designed for students with at least one year of previous graduate studies. *(Lec. 3) Pre: permission of instructor. May not be repeated.* Staff

691, 692 Special Problems *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Medical Technology

See Clinical Laboratory Science on page 44.

Medicinal Chemistry

M.S., Ph.D. (Pharmaceutical Sciences)
401-792-2776

Graduate Faculty

Chairperson: Professor Raymond P. Panzica, Ph.D., 1972, University of Utah
Professor Elie Abushanab, Ph.D., 1965, University of Wisconsin
Assistant Professor Bongsup P. Cho, Ph.D., 1985, University of Illinois Medical Center
Adjunct Assistant Professor Thomas M. Lalor, Ph.D., 1982, Tufts University

Specializations

Research activities are focused on the design and synthesis of chemotherapeutic agents. The areas of cancer and viral chemotherapy receive the greatest attention from our faculty. Research projects include the rational development of new compounds by synthetic or microbial methods, the chemical modification of clinical agents to facilitate drug delivery to targeted sites, and the synthesis of enzyme inhibitors. Other projects focus on the synthesis of agents to combat tropical and cardiovascular diseases, and on mechanisms of chemical carcinogenesis.

Master of Science

Admission requirements: GRE (for graduates of non-U.S. universities only) and bachelor's degree in pharmacy, chemistry, biochemistry, or allied sciences.

Program requirements: thesis; A.C.S. placement examination (organic) to determine specific program requirement; CHM 431, 432, or BCH 435 or equivalent; CHM 425, 427, and 521 or 522; MCH 443, 444, or equivalent; MCH 548 or equivalent, 621, 622; written master's examination. All students must register for and attend a seminar each semester while in graduate residence. Each student will present one seminar per semester unless otherwise indicated by the majority of the departmental faculty.

Doctor of Philosophy (Pharmaceutical Sciences)

Admission requirements: GRE and master's degree in pharmacy, chemistry, biochemistry, or allied sciences, or bachelor's degree in one of these with evidence of superior ability.

Program requirements: dissertation; A.C.S. placement examination (organic) to determine specific program requirement; same as for master's degree plus CHM 521 and 522; also, MCH 549 is recommended; primary emphasis in organic, medicinal chemistry, and pharmaceutical analysis. Comprehensive examination.

Qualifying examination is required for candidates accepted without M.S. degree.

MCH Courses
Medicinal Chemistry

443, 444 Organic Medicinal Chemistry *(I and II, 3 each)*

497, 498 Special Problems *(I and II, 1–5 each)*

526 Lipid Chemistry
See Food Science and Technology 526.

548 (or PCG 548) Physical Methods of Identification *(II, 3)* Utilization of physical methods (primarily spectroscopic) in the structure elucidation of complex organic molecules. Emphasis on interpretation of ultraviolet, infrared, nuclear magnetic resonance, mass, and optical rotatory dispersion spectra. *(Lec. 3) Pre: CHM 425 and/or permission of instructor.* Staff

549 Synthesis *(I and II, 3)* Theoretical and applied aspects in synthesis of selected organic compounds of medicinal significance. *(Lec. 1, Lab. 6)* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

621, 622 Seminar *(I and II, 1 each)* Seminar discussions including student presentations of papers on selected topics in medicinal chemistry. *(Seminar) May be repeated for a maximum of 3 credits. S/U credit.* Staff

643 Advanced Organic Medicinal Chemistry *(II, 3)* Synthesis, modes of action, and effects on pharmacological activity. Analgesics, cholinergics, folic acid antagonists, diuretics, and sulfonamides are included. *(Lec. 3) Pre: CHM 522. In alternate years. Next offered 1995–96.* Staff

646 Alkaloids *(I, 3)* Advanced course dealing with proof of structure, synthesis, chemical properties, and biological activity of various alkaloids. *(Lec. 3)* Abushanab

697, 698 Research in Medicinal Chemistry *(I and II, 1–3 each)* Literature survey, laboratory work, and a detailed research report on one or more assigned topics in medicinal chemistry. *(Independent Study)* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

429 Comprehensive Design *(II, 3)*
430 Computer-Aided Design *(I or II, 3)*
431 Computer Control of Mechanical Systems *(II, 3)*
434 Thermal Environmental Engineering *(II, 3)*
437 Turbomachinery Design *(I, 3)*
438 Internal Combustion Engines *(I, 3)*
439 Applied Energy Conversion *(II, 3)*
440 Mechanics of Composite Materials *(II, 3)*
446 (or IME 446) Metal Deformation Processes *(I, 3)*
448 Heat and Mass Transfer *(I, 3)*
449 (or IME 449) Product Design for Manufacture *(II, 3)*
455 Advanced Fluid Mechanics *(I, 3)*
464 Vibrations *(II, 3)*
465 Experimental Mechanics *(I, 3)*
466 Introduction to Finite Element Method *(II, 3)*
491, 492 Special Problems *(I and II, 1–6 each)*

501, 502 Graduate Seminar *(I and II, 1 each)* Discussions, presentation of papers based on research, or detailed literature surveys. Attendance is required of all students in graduate residence. *(Seminar) S/U credit.* Staff

503 Linear Control Systems
See Electrical Engineering 503.

504 Optimal Control Theory
See Electrical Engineering 504.

506 Expert Systems for Mechanical Design and Manufacturing *(I, 3)* Expert systems structure; knowledge bases, inference engines, and artificial intelligence languages. Applications to mechanical design and manufacturing problems. Graph theory and expert systems for mechanism design; features for design and manufacturing. *(Lec. 3) Pre: 430 or equivalent.* Datseris or Olson

521 Reliability Analysis and Prediction *(II, 3)* Statistical analysis of failure of complex engineering systems, design factors contributing to functional system survival, failure, distribution functions, redundancy, confidence, reliability testing. *(Lec. 3) Pre: MTH 451 or equivalent, MCE 423 or permission of instructor.* Staff

523 Advanced Kinematics I *(II, 3)* Analytical kinematic and dynamic analysis of planar mechanisms, graph theory, topological synthesis, topological analysis, Burmester theory, mechanism design software. *(Lec. 3) Pre: 323 or equivalent.* Datseris or Olson

541 Advanced Thermodynamics I *(I or II, 3)* Advanced study of classical thermodynamics with emphasis on basic concepts, laws, and thermodynamic relationships. Selected topics of current interest including areas of irreversible thermodynamics, statistical mechanics, and the thermodynamics of solids. *(Lec. 3) Pre: 341, 342, or permission of instructor.* Wilson, Zhang, and Ibrahim

545 Heat Transfer *(I, 3)* Conduction in two and three dimensions and conducting systems with radiation and fluid motion. Solutions obtained by mathematics, computer-numerical methods, and analog devices. *(Lec. 3) Pre: 448.* Faghri, Wilson, and Zhang

546 Convection Heat Transfer *(II, 3)* Relationship between heat transfer and fluid flow with emphasis on the solution of governing equations by exact methods, integral methods. and similarity techniques. *(Lec. 3) Pre: 448.* White, Faghri, and Zhang

549 Advanced Product Design for Manufacture
See Industrial and Manufacturing Engineering 549.

550 Theory of Continuous Media *(I, 3)* Basic course for first-year graduate students which develops and unifies the laws of mechanics as applied to the behavior of continua. Application to solids and fluids. *(Lec. 3) Pre: CVE 220, MCE 354, 372, or permission of instructor.* Sadd

551 Fluid Mechanics I *(I, 3)* Basic treatment of real fluid flows using the continuum mechanics approach. Exact solutions of the governing equations. Laminar shear flows and boundary layer theory, turbulent transition. *(Lec. 3) Pre: 354 or equivalent.* Lessmann and White

561 Computational Methods in Solid Mechanics *(I or II, 3)* Finite and boundary element methods based on variational and weighted residual concepts; practical implementation to field problems in elasticity, plasticity, and heat conduction. *(Lec. 3) Pre: 373 and one graduate course in elasticity or heat conduction.* Sadd and Taggart

562 Computational Methods in Fluid Flow and Heat Transfer *(I or II, 3)* Computational techniques and applications for practical problems concerning multidimensional fluid flow, heat and mass transfer, and chemical reactions. *(Lec. 3) Pre: undergraduate work in fluid mechanics and heat transfer or permission of instructor.* Faghri

563 Advanced Dynamics *(I and II, 3)* Dynamics of a system of particles, Lagrange's equations from an advanced point of view. Variational methods, nonconservative and nonholonomic systems; matrix-tensor specifications of rigid body motions, normal coordinates. Hamilton's equation of motion, canonical transformation, Hamilton-Jacobi theory. *(Lec. 3) Pre: 366 and 372 or equivalent.* Datseris

564 Advanced Vibrations *(I, 3)* Theory of vibration of systems with concentrated masses and stiffness; systems with one degree of freedom, vibration isolation systems with many degrees of freedom, matrix methods, dynamic vibration absorbers, torsional vibration, approximate numerical methods. Experimental methods and design procedures. *(Lec. 3) Pre: 464.* Palm

565 Wave Motion and Vibration of Continuous Media *(II, 3)* Wave motion and vibrations of strings, rods, beams, plates, and membranes; dynamic elasticity theory; Rayleigh surface waves; solutions using separation of variables and integral transforms. *(Lec. 3) Pre: 373, 464, or equivalent.* Sadd and Shukla

566 The Mechanics of Robot Manipulators *(I or II, 3)* Detailed analysis of the kinematics, dynamics, and control of industrial-type robot manipulator systems *(Lec. 3) Pre: 323, 366, or permission of instructor.* Palm and Jouaneh

568 Theory of Plates
See Civil Engineering 568.

571 Theory of Elasticity I *(I, 3)* Development of the basic field equations; generalized Hooke's law; general concepts of stress and strain; plane problems; stress functions; Saint Venant torsion and flexure; introduction to three-dimensional problems. *(Lec. 3) Pre: CVE 220 or equivalent.* Sadd, Ghonem, Shukla, and Taggart

576 Fracture Mechanics *(II, 3)* Fundamentals of linear elastic fracture mechanics, stress analysis viewpoint, energy viewpoint, two-dimensional and three-dimensional problems, elastic-plastic considerations, and crack extension behaviors. *(Lec. 3) Pre: 426 or permission of instructor.* Shukla and Ghonem

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

623 Advanced Kinematics II *(I, 3)* Planar, curvature theory, spatial kinematics: homogeneous transformations, screw theory, quaternions, dual numbers, angles, and vectors, applications to robot and machine tool calibration. *(Lec. 3) Pre: MCE 523 or permission of instructor.* Datseris and Olson

641 Advanced Thermodynamics II *(I or II, 3)* Continuation of 541. *(Lec. 3) Pre: 541 or permission of instructor.* Wilson and Ibrahim

646 (or CHE 646) Radiation Heat Transfer *(I or II, 3)* Radiant exchange between surfaces. Radiative properties of surfaces. Exchange among nonideal surfaces. Gas-radiative exchange. Radiative exchange with volume emitters. Furnace design applications. *(Lec. 3) Pre: 545 or CHE 644 or permission of instructor.* Staff

652 Experimental Methods in Fluid Mechanics *(II, 3)* An overview of measurement techniques and instrumentation used in the current practice of experimental fluid mechanics. Course emphasizes hot wire, hot film, and laser anemometry. Provides practical laboratory experience. *(Lec. 2, Lab. 3) Pre: 551 or permission of instructor.* Lessmann

653 Fluid Mechanics II *(II, 3)* Continuation of 551, including turbulent modeling, turbulent shear flows and boundary layers, in-

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

629, 630 Functional Analysis I, II *(I and II, 3 each)* Banach and Hilbert spaces, basic theory. Bounded linear operators, spectral theory. Applications to analysis. Application to a special topic such as differential operators, semigroups and abstract differential equations, theory of distributions, or ergodic theory. *(Lec. 3) Pre: 536 or permission of instructor.* Staff

641 Partial Differential Equations I *(I, 3)* First order systems. The Cauchy-Kowalewsky theorem. The Cauchy problem. Classification of partial differential equations. Hyperbolic equations. Mainly the theory of the subject. Students interested in techniques for the solution of standard equations should take 441. *(Lec. 3) Pre: 215, 435, and 462. In alternate years. Next offered fall 1994.* Staff

642 Partial Differential Equations II *(II, 3)* Elements of potential theory. Elliptic equations. Green's function. Parabolic equations. Introduction to the theory of distributions. *(Lec. 3) Pre: 641. In alternate years. Next offered spring 1995.* Staff

691, 692 Special Topics I, II *(I and II, 3 each)* Advanced topics of current research in mathematics will be presented with a view to expose the students to the frontiers of the subject. *(Independent Study) Pre: permission of chairperson.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Mathematics Topics for Teachers *(I and II, 0–3)* Especially designed for teachers of mathematics. Basic topics of mathematics from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification. Not for degree credit.* Staff

Mechanical Engineering and Applied Mechanics

M.S., Ph.D.
401-792-2524

Graduate Faculty

Chairperson: Professor Martin H. Sadd, Ph.D., 1971, Illinois Institute of Technology
Director of Graduate Studies: Professor Arun Shukla, Ph.D., 1981, University of Maryland
Professor Philip Datseris, Ph.D., 1976, Columbia University
Professor Frank DeLuise, M.S., 1950, University of Rhode Island
Professor Mohammad Faghri, Ph.D., 1973, Oregon State University
Professor William R. Ferrante, Ph.D., 1962, Virginia Polytechnic Institute
Professor Hamouda Ghonem, Ph.D., 1978, McGill University
Professor Thomas J. Kim, Ph.D., 1967, University of Illinois
Professor Richard C. Lessmann, Ph.D., 1969, Brown University
Professor William J. Palm, Ph.D., 1971, Northwestern University
Professor Frank M. White, Ph.D., 1959, Georgia Institute of Technology
Professor Mason P. Wilson, Jr., Ph.D., 1968, University of Connecticut
Associate Professor Daniel G. Olson, Ph.D., 1987, University of Minnesota
Assistant Professor Osama Ibrahim, Ph.D., 1991, University of Wisconsin, Madison
Assistant Professor Musa Jouaneh, Ph.D., 1989, University of California, Berkeley
Assistant Professor David G. Taggart, Ph.D., 1989, University of Pennsylvania
Assistant Professor Zongqin Zhang, Ph.D., 1990, Duke University
Adjunct Professor Alexander J. Patton, Ph.D., 1972, University of Rhode Island
Adjunct Associate Professor Richard H. Messier, Ph.D., 1975, Brown University
Adjunct Assistant Professor Richard Hubbell, Ph.D., 1989, University of Rhode Island
Adjunct Assistant Professor Wayne Tucker, Ph.D., 1987, University of Rhode Island
Professor Emeritus Charles D. Nash, Jr., Ph.D., 1959, Ohio State University

Specializations

Fluid mechanics: boundary layer theory, separated flows, turbulence, particle flow interactions, dispersions, geophysical flows, flow measurement, computational methods.

Robotics and design: robotics, expert systems, kinematics, design optimization, lubrication theory, dynamic face seals, reliability analysis and prediction, computer-aided design, manufacturing.

Solid mechanics: elasticity, plasticity, continuum mechanics, fracture mechanics, fatigue, photomechanics, wave propagation and dynamic geomechanics, computational methods including finite element and boundary element methods, composite and ceramic material behavior, micromechanics, nonlinear mechanics, mechanics of waterjet processing, fiber optic sensors.

Systems and control: robotics, mathematical modeling of control systems, stability, nonlinear systems, microprocessor and digital control, advanced dynamics, lumped and distributed parameter vibration theory.

Thermal science: phase change problems, convection heat transfer, direct contact heat transfer, direct energy conversion, solar energy developments, new engine developments, thermal pollution, solar collector systems, computational heat transfer.

Master of Science

Admission requirements: GRE (required of foreign applicants only), B.S. degree in mechanical engineering, applied mechanics, aerospace engineering, or in a related field such as engineering science, civil engineering, applied mathematics, applied physics. Students admitted to the program will be expected to have the equivalent of MCE 372 and 373. Students without this background may be required to make up this deficiency with no program credits.

Program requirements: thesis option—30 credits exclusive of seminar; thesis (required of all full-time students); one course outside the area of specialization; MCE 501, 502, graduate seminar (required of all on-campus students). Nonthesis option for part-time students—permission of chairperson; 33 credits exclusive of seminar, including one course outside specialization; one course requiring a substantial paper involving significant independent study; and a comprehensive examination.

Financial aid: a number of graduate and research assistantships are available for qualified M.S. students.

Doctor of Philosophy

Admission requirements: GRE (required of foreign applicants only); master's degree. Exceptional students with a bachelor's degree and superior master's candidates who have passed the Ph.D. qualifying examination also will be considered.

Program requirements: Ph.D. qualifying examination; students admitted with only a bachelor's degree are required to take this examination after one year of full-time study. Completion of a minimum of 24 credits of course work beyond the master's degree, exclusive of seminar (48 credits of course work after bachelor's degree); MCE 501, 502, graduate seminar (required of all on-campus students). Comprehensive examination and dissertation.

Financial aid: a number of graduate and research assistantships are available for qualified Ph.D. students. Temporary instructorships may be available for highly qualified Ph.D. students.

General Information

Programs of study can be designed for individuals who are employed on a full-time basis. However, all Ph.D. candidates must register full time for two consecutive semesters prior to taking the comprehensive examination.

MCE Courses Mechanical Engineering and Applied Mechanics

423 Design of Machine Elements *(I, 3)*
425 Lubrication and Bearings *(I, 3)*
426 Advanced Mechanics of Materials *(I, 3)*

Professor James T. Lewis, Ph.D., 1969, Brown University
Professor Pan-Tai Liu, Ph.D., 1968, State University of New York, Stony Brook
Professor Lewis I. Pakula, Ph.D., 1972, Massachusetts Institute of Technology
Professor Oved Shisha, Ph.D., 1958, Hebrew University
Professor Robert C. Sine, Ph.D., 1962, University of Illinois
Professor E. Ramnath Suryanarayan, Ph.D., 1961, University of Michigan
Professor Ghasi Ram Verma, Ph.D., 1957, Rajasthan University
Associate Professor Dean Clark, Ph.D., 1978, Brown University
Assistant Professor Nancy Eaton, Ph.D., 1992, Emory University
Assistant Professor Orlando Merino, Ph.D., 1988, University of California, San Diego
Assistant Professor Catherine Roberts, Ph.D., 1992, Northwestern University
Adjunct Assistant Professor David H. Wood, Ph.D., 1972, University of Rhode Island
Professor Emeritus Emilio O. Roxin, Ph.D., 1959, University of Buenos Aires
Professor Emeritus Sol Schwartzman, Ph.D., 1953, Yale University

Specializations

Ordinary, functional, and stochastic differential equations, partial differential equations, abstract differential equations, difference equations, functional analysis, approximation theory, probability, fluid mechanics, control theory, and differential games.

Master of Science

Admission requirements: bachelor's degree with strong undergraduate background in mathematics. Applicants with deficiencies in mathematics may be accepted subject to taking certain undergraduate courses in addition to the graduate program requirements.

Program requirements: 30 credits (or 24 plus thesis), including at least 18 credits in mathematics of which at least 12 must be at the 500 level or above. A course requiring a substantial paper involving significant independent study and a written comprehensive examination are required for the nonthesis option. MTH 435 and 513 must be completed with a grade of A or B. Recommended courses include MTH 515, 525, 535, 536, and 562.

Doctor of Philosophy

Admission requirements: same as for master's program.

Program requirements: MTH 513, 515, 525, 535, 536, and 562, plus specialized courses and electives. Reading ability (in candidate's specialty and with a dictionary) in one language chosen from French, German, or Russian. An oral qualifying examination is required of all candidates.

Also see the listing under Applied Mathematical Sciences on page 30.

General Information

Programs of study can be designed for individuals who are employed on a full-time basis. However, all Ph.D. candidates must register full time for two consecutive semesters prior to taking the doctoral comprehensive examination.

MTH Courses
Mathematics

418 Matrix Analysis *(I, 3)*
420 Topics in Foundations *(I, 3)*
425 Topology *(I, 3)*
435, 436 Introduction to Mathematical Analysis I, II *(I and II, 3 each)*
437, 438 Advanced Calculus and Application *(I and II, 3 each)*
441 Introduction to Partial Differential Equations *(I, 3)*
444 Ordinary Differential Equations *(II, 3)*
447 (or CSC 447) Discrete Mathematical Structures *(I or II, 3)*
451 Introduction to Probability and Statistics *(I and II, 3)*
452 Mathematical Statistics *(II, 3)*
456 Introduction to Random Processes *(II, 3)*
461 Methods of Applied Mathematics *(I, 3)*
462 Functions of a Complex Variable *(II, 3)*
464 Advanced Engineering Mathematics III *(II, 3)*
471 Introduction to Numerical Analysis I *(I, 3)*
472 Introduction to Numerical Analysis II *(II, 3)*
492 Special Problems *(I and II, 1–3)*

513 Linear Algebra *(I, 3)* Linear spaces and transformations, linear functionals, adjoints, projections, diagonalization, Jordan form of matrices, inner products; positive, normal, self-adjoint, and unitary operators; spectral theorem, bilinear and quadratic forms. *(Lec. 3)* Staff

515, 516 Algebra I, II *(I and II, 3 each)* Groups, rings, modules, commutative algebra. *(Lec. 3) Pre: 316. In alternate years. Next offered 1994–95.* Staff

525 Topology *(II, 3)* Topological spaces, separation properties, connectedness, compactness, uniformities. Function spaces, spaces of continuous functions, and complete spaces. *(Lec. 3) Pre: 425 or equivalent. In alternate years. Next offered spring 1995.* Staff

535, 536 Measure Theory and Integration *(I and II, 3 each)* Elements of topology and linear analysis. Lebesgue measure and integration in R, in R^n, and in abstract spaces. Convergence theorems. Bounded variation, absolute continuity, and differentiation. Lebesgue-Stieltjes integral. Fubini and Tonelli theorems. The classical Banach spaces. *(Lec. 3) Pre: 435.* Staff

545, 546 Ordinary Differential Equations I, II *(I and II, 3 each)* Existence and uniqueness theorems. Continuous dependence on parameters and initial conditions. Singularities of the first and second kinds, self-adjoint eigenvalue problems on a finite interval. Oscillation and comparison theorems. Introduction to delay and difference equations. Elements of stability theory of Lyapunov's second method. *(Lec. 3) Pre: 435. In alternate years. Next offered 1995–96.* Staff

547 (or CSC 547) Combinatorics and Graph Theory *(I, 3)* Enumeration: generating functions, recurrence relations, classical counting numbers, inclusion-exclusion, combinatorial designs. Graphs and their applications: Euler tours, Hamilton cycles, matchings and coverings in bipartite graphs, the four-color problem. *(Lec. 3) Pre: 215 or equivalent. In alternate years. Next offered fall 1994.* Staff

548 Topics in Combinatorics *(II, 3)* Topics such as Ramsey theory, Polya theory, network flows and the max-flow-mincut variations, applications in operations research; finite fields and algebraic methods; block designs, coding theory, other topics. *(Lec. 3) Pre: 547 or permission of instructor. In alternate years. Next offered spring 1996.* Staff

550 Probability and Stochastic Processes *(I, 3)* Review of probability theory. Generating functions, renewal theory, Markov chains and processes, Brownian motions, stationary processes. *(Lec. 3) Pre: 437 or 435 and 451, or permission of instructor. In alternate years. Next offered spring 1996.* Staff

551 Mathematical Statistics *(II, 3)* Theory of estimation and hypothesis testing. Large sample methods. Regression and analysis of variance. *(Lec. 3) Pre: 437 or 435 and 451, or permission of instructor. In alternate years. Next offered spring 1995.* Staff

561 Advanced Applied Mathematics *(II, 3)* Linear spaces, theory of operators. Green's functions, eigenvalue problems of ordinary differential equations. Application to partial differential equations. *(Lec. 3) Pre: 461.* Staff

562 Complex Function Theory *(I, 3)* Rigorous development of theory of functions. Topology of plane, complex integration, singularities, conformal mapping. *(Lec. 3) Pre: 435 and 436 or 437 and 438 and permission of instructor. In alternate years. Next offered fall 1994.* Staff

572 Numerical Analysis *(II, 3)* Further numerical methods of solution of simultaneous equations, partial differential equations, integral equations. Error analysis. *(Lec. 3) Pre: 472.* Staff

575 Approximation Theory and Applications to Signal Processing
See Electrical Engineering 575.

591, 592 Special Problems *(I and II, 1–3 each)* Advanced work under the supervision of a member of the department arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson.* Staff

502 Research Methods in Marine Affairs *(II, 3)* Emphasis on the application of alternative research methods utilized in a typical interdisciplinary study. Development of specific research projects. *(Lec. 3) Pre: 482 or permission of chairperson.* Marti

511 Ocean Uses and Marine Science *(II, 3)* Introduction to selected ocean uses focusing on the interplay of public policy and marine science. Emphasis on policy implications of uses such as resource and energy extraction and waste disposal. *(Lec. 3)* Burroughs

512 (or PSC 512) Marine Science and Policy Analysis *(II, 3)* The role of ocean science in initiation, forecasting, implementation, and evaluation of public policy is examined through waste disposal, protected areas, and oil development, among other topics. *(Seminar) Pre: 511 or permission of instructor.* Burroughs

516 (or CPL 516) Seminar on the Urban Waterfront *(I, 3)* The urban environment, its evolution, structure, and function as it relates to the waterfront. Topics on policy, management, and utilization on the local and regional level will be covered. Field trip and student project required. *(Seminar) Pre: credit or concurrent enrollment in marine affairs or community planning or permission of instructor.* Krausse

520 Seminar in Coastal Margin Management *(II, 3)* Nature of oil, gas, and other mineral resources on the outer continental shelf, public and private sector decisions, and environmental issues are reviewed. Emphasis on the utility of data for policy development. *(Seminar)* Burroughs

521 Coastal Zone Law *(I, 3)* Examination of the authority of different levels and agencies of government to make decisions affecting coastal regions. Survey of existing and proposed state and national legislation affecting coastal regions. *(Lec. 3)* Nixon

523 Fisheries Law and Management *(II, 3)* Examination of the relationship between law and fisheries policy on the international and national level, law relating to fisheries, jurisdictional levels, function of law in implementing fisheries management policy. *(Lec. 3)* Nixon

526 LANDSAT Remote Sensing and Analysis *(II, 3)* Theory and application of the LANDSAT remote sensing system and geographical information systems emphasizing coastal resource surveillance. Development and interpretation of supervised and unsupervised classifications from digitized reflectance values obtained from the MS and TM scanners. *(Lec. 3) Pre: 482 or permission of instructor.* Staff

530 Coastal Area Management Seminar *(SS, 3)* Examines coastal resource problems from a spatial approach, emphasizing present and potential user conflicts and the manner in which they have been addressed here and abroad. *(Seminar) Pre: credit or concurrent enrollment in MAF, CPL, or REN, graduate standing, or permission of instructor.* West

562 Admiralty Law *(I, 3)* Fundamentals of admiralty law: collisions at sea, bills of lading, marine insurance, and rights of seamen. Case studies of marine transportation problems and their resolution by law. *(Lec. 3)* Nixon

563 Maritime Transportation *(II, 3)* Passenger and commodity transportation. Analysis of the relationship between transportation services and the spatial distribution of activities. Emphasis on multimodel transport and bulk commodities. *(Lec. 3) Pre: senior or graduate standing or permission of instructor.* Marti

564 Port Operations and Policy *(II, 3)* Analysis of coastal and international trade routes and the response of ports. Special emphasis on the container revolution, liquid natural gas transportation, and deep-water ports for supertankers. *(Lec. 3)* Marti

571 Marine Geography *(I, 3)* The marine region as a unique complex of physical and cultural elements. The purpose is to analyze functional relationships within the region and to assess forms of regional organization and control. *(Lec. 3)* Staff

577 (or PSC 577) International Ocean Law *(I, 3)* Principles of international law as they relate to ocean management problems. Jurisdiction in the territorial sea, contiguous zones, and the deep seabed will be examined within the international legal framework. *(Lec. 3) Pre: 312, CPL 434, or permission of instructor.* Juda

578 International Ocean Organizations *(II, 3)* International organizations involved in marine-related activities, including their planning, management, and regulatory and assistance functions. Attention to the impact of these organizations on national policies in the developed and developing worlds. *(Lec. 3) Pre: 577 or permission of instructor.* Juda

579 Marine Jurisdictional Issues *(II, 3)* Examination and analysis of national controls in the oceans, including international and domestic maritime boundaries, types of offshore zones, and claims to special jurisdictional rights. *(Lec. 3) Pre: 571 or 577 or permission of instructor.* Staff

582 Estuarine Policy *(I, 3)* Policy options, governing structures, and management techniques for estuarine areas are considered with special attention to the effectiveness of the resulting approaches. *(Lec. 3)* Burroughs

586 Environmental Impact Assessment and Analysis *(I, 2)* Centers on an impact assessment of a proposed coastal community project and includes the development of project alternatives, associated impacts, preparation of a public hearing, and final report. Relevant methods and procedures are reviewed. *(Practicum) Pre: matriculated graduate student or permission of instructor. 586 may not be used for program credit unless 587 is completed in the same academic year.* West

587 Environmental Assessment Meeting and Report *(II, 2)* Continuation of 586, which must be taken in the same academic year. Focus is on the public meeting and completion of written report prepared in 586. *(Practicum) Pre: 586.* West

589 Master's Project Research *(I or II, 3)* Preparation of a major research paper for M.M.A. students under the guidance of a graduate faculty member. *(Independent Study) Pre: graduate standing in the M.M.A. program. S/U credit.* Staff

591, 592 Directed Study or Research *(I and II, 3 each)* Areas of special research interest of graduate students. *(Independent Study) Pre: permission of chairperson.* Staff

595 Problems of Modernization in Developing Nations
See Resource Economics 595.

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.* Staff

602 Federal Ocean Policy and Organization *(II, 3)* Ocean policy development and implementation by the executive and legislative branches of government. Allocation of powers and analysis of the decision-making process for the oceans. *(Lec. 3)* Juda

651, 652 Marine Affairs Seminar *(I and II, 3 each)* Interdisciplinary seminar conducted by marine affairs program faculty supplemented by guest speakers from industry and government. Focuses on problems of marine resources development and management at the local, state, national, and international policy levels. *(Seminar)* Burroughs, Juda, Krausse, Marti, Nixon, and West

Mathematics

M.S., Ph.D.
401-792-2709

Graduate Faculty

Chairperson: Professor John T. Montgomery, Ph.D., 1971, University of Wisconsin
Director of Graduate Studies: Professor Barbara Kaskosz, Ph.D., 1977, Polish Academy of Sciences
Professor Raymond A. Beauregard, Ph.D., 1968, University of New Hampshire
Professor Dilip K. Datta, Ph.D., 1963, Delhi University
Professor Rodney D. Driver, Ph.D., 1960, University of Minnesota
Professor Norman J. Finizio, Ph.D., 1972, Courant Institute of Mathematical Sciences, New York University
Professor John B. Fraleigh, M.A., 1956, Princeton University
Professor Edward A. Grove, Ph.D., 1969, Brown University
Professor Gerasimos Ladas, Ph.D., 1968, New York University

Pre: 240 or permission of instructor. Not for graduate credit for students with credit in 444. Boothroyd and Dewhurst

545 Manufacturing Systems: Analysis, Design, Simulation *(I, 3)* Problems in manufacturing system analysis and design. Quantitative models and simulation methods applied to production planning, control, scheduling, resource allocation, and decision making in various types of manufacturing systems. *(Lec. 3) Pre: 433 or permission of instructor.* Shao

546 Advanced Metal Deformation Processes *(II, 3)* Theory of metal flow under different loading conditions. Prediction of metal forming process capabilities. Advanced topics include effects of anisotropy and mechanics of powder forming. *(Lec. 3) Pre: 340 or permission of instructor. Not for graduate credit for students with credit in 446.* Dewhurst

549 (or MCE 549) Advanced Product Design for Manufacture *(I, 3)* Techniques for analyzing product structures for ease of assembly and manufacture. Considers mechanical and electronic products and choice of materials and processes. A design project and term paper are required. *(Lec. 3) Pre: 240 or 340 and credit or concurrent enrollment in 444 or permission of instructor. Not for graduate credit for students with credit in 449.* Dewhurst or Boothroyd

550 Design for Producibility *(II, 3)* Addresses the capabilities of primary shape-generating processes. Concentration on manufacturability guidelines and on the effects of design decisions on material choice, processing times, and tooling costs. *(Independent Study) Pre: 449 or 549.* Knight or Dewhurst

555, 556 Engineering Applications of Mathematical Programming I, II *(I and II, 3 each)* Sensitivity analysis and pricing problems, practical problems in degeneracy and duality, decomposition methods for large-scale systems, applied convex, integer, nonlinear, and quadratic programming methods. An introduction to stochastic programming. *(Lec. 3) Pre: 432 for 555 or permission of instructor; 555 for 556 or permission of instructor. In alternate years.* Staff

565 Theory of Scheduling *(II, 3)* Sequencing problems, finite sequencing for a single machine n/m job shop problems with analytical and heuristic procedures, networks applied to scheduling, queuing systems in scheduling, probabilistic scheduling problems. Survey of selected literature. *(Lec. 3) Pre: 432 or permission of instructor. In alternate years. Next offered 1995–96.* Shao

591, 592 Special Problems *(I and II, 1–6 each)* Advanced work under supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

610 Topics in Applied Queuing Theory *(I, 3)* Poisson and Erland queues, imbedded chains, M/G/1 and G/M/1 queues, and related topics in queuing theory. Analysis of a wide variety of queues with an applications orientation. *(Lec. 3) Pre: 433 or permission of instructor. In alternate years. Next offered 1995–96.* Staff

634 Design and Analysis of Industrial Experiments *(II, 3)* Further development of topics in analysis of variance. Randomized blocks, Latin squares and related designs, factorial experiments, confounding and fractional replications, and split-plot designs. Design and analyses of engineering experiments. *(Lec. 3) Pre: 533.* Lawing

635 (or STA 635) Response Surfaces and Evolutionary Operations *(II, 3)* Methods of determining the response surface for multiple factors over a specified range and techniques for seeking an optimum. First- and second-order response surfaces. Rotatable second-order design. Central composite rotatable designs. Multivariable EVOP programs and other topics in evolutionary operations. *(Lec. 3) Pre: 533 or equivalent.* Lawing

660 Methods of Optimization *(II, 3)* Methods of optimization: indirect, direct elimination, climbing. Geometric programming. Problems and other topics in applied optimization. *(Lec. 3) Pre: CSC 500 or permission of instructor. In alternate years. Next offered 1995–96.* Staff

691, 692 Advanced Special Problems in Industrial Engineering *(I and II, 1–6 each)* Advanced work under the supervision of a staff member arranged to suit the individual requirements of the student. *(Independent Study) Pre: permission of chairperson. May be repeated for a maximum of 12 credits.* Staff

Marine Affairs

M.A., M.M.A.
401-792-2596

Graduate Faculty

Chairperson: Professor Lawrence Juda, Ph.D., 1973, Columbia University
Director of Graduate Studies: Associate Professor Dennis W. Nixon, J.D., 1975, University of Cincinnati; M.M.A., 1976, University of Rhode Island
Professor Bruce E. Marti, Ph.D., 1982, University of Florida
Professor Niels West, Ph.D., 1973, Rutgers—The State University
Associate Professor Richard H. Burroughs, Ph.D., 1975, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution
Assistant Professor William R. Gordon, Jr., Ph.D., 1987, Texas A&M University
Assistant Professor Gerald H. Krausse, Ph.D., 1975, University of Pittsburgh
Adjunct Professor Thomas Kitsos, Ph.D., 1972, University of Illinois
Adjunct Professor Claiborne D. Pell, M.A., 1946, Columbia University
Adjunct Professor Gerald Seifert, J.D., 1964, Indiana University; M.M.A., 1978, University of Rhode Island
Adjunct Associate Professor Jens C. Sorensen, Ph.D., 1978, University of California, Berkeley
Professor Emeritus Lewis M. Alexander, Ph.D., 1949, Clark University
Professor Emeritus John A. Knauss, Ph.D., 1959, University of California

Specializations

Coastal zone management, marine transportation and port planning, fisheries law and management, international marine policy and law, marine geography.

Master of Arts (M.A.)

Admission requirements: GRE and bachelor's degree in related science or social science. For international students, minimum TOEFL score of 575. Full-time applicants are admitted for September only.

Program requirements: thesis and MAF 482, 502, 577, 651, 652; MAF 511 or appropriate oceanography substitute; REN 514 or appropriate resource economics substitute; plus a minimum of 18 elective credits for a total of 45 credits.

Master of Marine Affairs (M.M.A.)

Admission requirements: prior graduate degree or five years of equivalent experience in marine areas. For international students, minimum TOEFL score of 575. Full-time applicants are admitted for September only.

Program requirements: nonthesis program; MAF 577, 589, 651, 652; REN 514; MAF 511 or appropriate oceanography substitute; plus 12 elective credits for a total of 30 credits; written comprehensive examination.

MAF Courses
Marine Affairs

413 (or APG 413) Peoples of the Sea *(I, 3)*
456 Polar Resources and Policy *(I, 3)*
461 Coastal Zone Uses *(I, 3)*
465 GIS Applications in Coastal and Marine Management *(II, 3)*
471 Island Systems *(II, 3)*
472 Marine Recreation Management *(II, 3)*
482 Quantitative Methods in Marine Affairs *(II, 3)*
484 Environmental Analysis and Policy in Coastal Management *(II, 3)*
491, 492 Special Problems *(I and II, 3 each)*
499 Directed Study *(I and II, 1–3)*

Manufacturing Engineering

M.S., Ph.D. (Industrial and Manufacturing Engineering)
401-792-2455

Graduate Faculty

Chairperson: Professor Winston A. Knight, Ph.D., 1967, Birmingham University
Director of Graduate Studies: Professor Peter Dewhurst, Ph.D., 1973, University of Manchester
Professor Geoffrey Boothroyd, Ph.D., 1962, D.Sc., 1974, University of London
Associate Professor William D. Lawing, Jr., Ph.D., 1965, Iowa State University
Associate Professor David M. Shao, Ph.D., 1970, State University of New York, Buffalo
Assistant Professor Manbir Sodhi, Ph.D., 1991, University of Arizona
Adjunct Professor Charles C. Reynolds, Ph.D., 1963, Massachusetts Institute of Technology

Specializations

Fundamentals of manufacturing processes, manufacturing automation, product design for efficient manufacture, and the organization of manufacturing systems.

Master of Science

Admission requirements: GRE (for graduates of non-U.S. universities only) and B.S. degree in industrial, manufacturing, or mechanical engineering. An applicant with a B.S. degree in another field of engineering, mathematics, physics, chemistry, or computer science will be considered; such applicants will be required to complete some deficiency courses.

Program requirements: 30 credits including thesis (six credits); IME 542; IME 544 and 549 or 591, 592, and a graduate elective; three credits each from the areas of fundamentals of manufacturing processes and manufacturing properties of materials, control and organization of manufacturing systems, and computer systems in manufacturing engineering and design. IME 340 or equivalent is a prerequisite.

Doctor of Philosophy

Admission requirements: GRE (for graduates of non-U.S. universities only) and B.S. degree in industrial, manufacturing, or mechanical engineering. An applicant with a B.S. degree in another field of engineering or in mathematics, physics, chemistry, or computer science will be considered; such applicants will be required to complete some deficiency courses. Although a person with a bachelor's degree may be admitted, this program is designed principally for people who have a master's degree.

Program requirements: qualifying examination may be waived for students with a master's degree. A minimum of 72 credits beyond the B.S. degree, 18 of which are dissertation credits (a master's degree may count for up to 30 credits). Fifty-four credits of course work including IME 541, 544, 549 and 18 credits of required electives with at least two courses selected from each of the following areas of concentration: fundamentals of manufacturing processes and manufacturing properties of materials, control and organization of manufacturing systems, and computer systems in manufacturing and design. Eighteen credits of IME 699. Reading proficiency in a foreign language may be required by the student's committee. A comprehensive examination must be taken after all formal course work is completed. All Ph.D. candidates must register full time for two consecutive semesters prior to taking the Ph.D. comprehensive examination. Dissertation research makes use of major modern laboratories in the listed areas of specialization.

Financial Aid

A number of graduate and research assistantships are available for qualified graduate students.

Also see Applied Mathematical Sciences on page 30.

IME Courses
Industrial and Manufacturing Engineering

404 Engineering Economy *(I and II, 3)*
411 Probability for Engineers *(I, 3)*
412 Statistics for Engineers *(II, 3)*
430 Design and Analysis of Compensation Systems *(II, 3)*
432 Operations Research: Deterministic Models *(I, 3)*
433 Operations Research: Stochastic Models *(II, 3)*
435 Introduction to Operations Research *(I and II, 3)*
441 Metal Casting *(II, 3)*
443 Machining and Machine Tools *(II, 3)*
444 Assembly and Handling Automation *(I, 3)*
446 (or MCE 446) Metal Deformation Processes *(II, 3)*
449 (or MCE 449) Product Design for Manufacture *(I, 3)*
450 Computer-Aided Industrial and Manufacturing Engineering *(I, 3)*
451 Industrial Engineering Systems *(II, 3)*
491, 492 Special Problems *(I and II, 1–6 each)*

500 Network Application in Industrial Engineering *(II, 3)* Industrial systems problems that can be formulated in terms of flows in networks. Critical path scheduling, transportation problems, allocation, sequencing, line balancing, etc. *(Lec. 3) Pre: 432 or permission of instructor. In alternate years.* Shao

513 Statistical Quality Assurance *(I, 3)* Topics in statistical quality control systems. Single, multiple, and sequential sampling. Design and analysis of a wide variety of statistical control systems used in conjunction with discrete and continuous data, for several kinds of data emission. *(Lec. 3) Pre: 412 or equivalent.* Staff

514 Special Topics in Statistical Quality Assurance *(II, 3)* Quality control evaluation and monitoring systems for short-run production processes; analysis of critical specifications in small limited sample opportunities; sequential analyses; statistical procedures for troubleshooting; small sample strategies. *(Lec. 3) Pre: 412 or equivalent or permission of instructor.* Staff

525 Simulation
See Computer Science 525.

533 Advanced Statistical Methods for Research and Industry *(I, 3)* Estimation and testing; regression and correlation; analysis of variance and related topics. Applications in industrial operations and engineering research. *(Lec. 3) Pre: 411 or permission of instructor.* Lawing

540 Production Control and Inventory Systems *(I, 3)* Theory and practice of industrial production control and inventory systems. A broad spectrum of mathematical models for static, dynamic, perpetual, and periodic inventory systems as they affect and relate to production. *(Lec. 3) Pre: 432 or permission of instructor.* Staff

541 Materials Processing and Metrology II *(I, 3)* Continuation of 340. Engineering analyses in the processing of materials. Dynamic coupling, tool-work-piece interaction, energy and thermal analysis; mechanics of material removal and displacements, advanced topics in mechanical electrical systems for processing of materials. *(Lec. 3) Pre: 340 or permission of instructor.* Staff

542 Introduction to Computer-Aided Manufacturing *(I, 3)* Use of computers in manufacturing. Planning and control of manufacturing facilities and operations. Group technology, flow lines, optimization of machining conditions, numerical and adaptive control, automation, robotic applications. *(Lec. 3) Pre: 443 or permission of instructor.* Knight

543 Fundamentals of Machining *(II, 3)* Fundamental treatment of the mechanics and economics of metal machining and grinding. Includes an introduction to numerical control and computer-aided programming of CNC machine tools. *(Lec. 3) Pre: CVE 220 and IME 340 or permission of instructor. Not for graduate credit for students with credit in 443.* Boothroyd, Dewhurst, and Knight

544 Automatic Assembly *(I, 3)* Types and economics of automatic assembly systems. Analysis of automatic feeding and orienting techniques for small parts. Application of robots in assembly. Economics of assembly systems for printed circuit boards. *(Lec. 3)*

530 Reading Interests of Children *(I or II, 3)* A survey of children's literature as it relates to the reading interests and information needs of children. Emphasis is on collection building, reference, reading guidance, and book promotion. *(Lec. 3) Pre: 503 or permission of instructor.* Eaton

531 Reading Interests of Young Adults *(I or II, 3)* Overview of young adult literature in the context of the special interests and information needs of adolescence. Emphasis on the building, use, and promotion of the young adult collection. *(Lec. 3) Pre: 503 or permission of instructor.* Eaton

535 Public Library Services to Children and Young Adults *(II, 3)* Public library services to children and young adults, with emphasis on the development of programs to meet library goals and objectives. *(Lec. 3) Pre: 502 or permission of instructor.* Eaton

536 Storytelling *(I or II, 3)* Selection, adaptation, and presentation of stories for children of all ages, including attention to sources of materials, planning the story hour, and training and practice in the art of storytelling. *(Lec. 3)* Daigneault

537 Health Sciences Librarianship *(II, 3)* Serves as an introduction to the field. Covers the literature, vocabulary, computer applications, reference tools, information retrieval, and environments relating to health sciences libraries. *(Lec. 3) Pre: 502 and 504 or permission of instructor.* Kellerman

538 Law Librarianship *(I, 3)* Introduction to legal bibliography and research and to a broad range of problems involved in the administration and operation of various kinds of law libraries. *(Lec. 3) Pre: 502 and 504 or permission of instructor.* Svengalis

539 Business Reference *(I, 3)* An introduction to all aspects of business reference sources and information services, including unique statistical and investment information on companies and industries. *(Lec. 3) Pre: 504.* Gilton

540 Library Materials in the Humanities *(I or II, 3)* Library resources in the humanities, including the major works, serial publications, and reference and bibliographical materials. *(Lec. 3) Pre: 503 and 504.* Gilton

541 Library Materials in the Social Sciences *(I or II, 3)* Library resources in the social sciences, including the major works, serial publications, and reference and bibliographical materials. *(Lec. 3) Pre: 503 and 504.* Tryon

542 Library Materials in Science and Technology *(I or II, 3)* Library resources in science and technology, including the major works, serial publications, and reference and bibliographical materials. *(Lec. 3) Pre: 503 and 504.* Carson

543 Government Publications *(I or II, 3)* Survey of the publishing activities and publications of national, state, and local governments with emphasis on the publications of the United States government. *(Lec. 3) Pre: 504.* Gilton

544 Information Science for Librarians *(I or II, 3)* An introduction to the interdisciplinary study of information science related to information (data) collection, analysis, processing, transmission, utilization, and communication, with emphasis on bibliographic data and its retrieval in modern libraries and information centers. *(Lec. 3) Pre: 502 and 504 or permission of instructor.* Staff

545 Indexing and Abstracting *(I or II or SS, 3)* Principles and techniques of indexing for the purpose of information storage and retrieval. Includes periodical indexing, book indexing, automatic indexing, abstracting, and thesaurus construction. *(Lec. 3) Pre: 504.* Kellerman

546 Computer Systems in Library Automation *(I or II, 3)* Introduction to principles of systems analysis and the tools of analysis. Study of computer hardware and software and the application of new technologies to library operations and services. *(Lec. 3) Pre: 501 or permission of instructor.* Walsh

547 Online Searching and Services *(I or II, 3)* Introduction to computerized information retrieval and the provision of computerized information services in libraries, including hands-on experience. *(Lec. 3) Pre: 501 and 504.* Siitonen

548 Microcomputer Applications in Library and Information Services *(I or II, 3)* Selection, evaluation, and integration of hardware and software specific to functions of different types of libraries and information centers. *(Lec. 3) Pre: 501 or permission of instructor.* Carson

549 Information Storage and Retrieval *(I or II, 3)* Theory and methods of analyzing, storing, and retrieving primarily bibliographic information and their applications in libraries and information services. Operation, monitoring, and evaluation of manual and computerized retrieval systems. *(Lec. 3) Pre: 501.* Staff

550 Advanced Cataloging *(I or II, 3)* Theory and problems in descriptive and subject cataloging and classification with emphasis on the use of Library of Congress subject headings and classification. Includes editing of original and copy cataloging for OCLC. Emphasis is on microforms, serials, rare books, music and sound recordings. *(Lec. 3) Pre: 505.* Zipkowitz

561 Library Effectiveness: Research and Evaluation *(I, 3)* Introduction to types and methods of research, applications of published research and research techniques to the evaluation and improvement of library and information services. *(Lec. 3) Pre: 15 hours of library science or permission of instructor.* Eaton

562 Administration of Special Collections, Archives, and Manuscripts *(I, 3)* Principles and techniques for administering manuscript and archival repositories, including acquisition policies, appraisal criteria, methodology, and preservation practices. *(Lec. 3) Pre: core courses or permission of instructor.* Maslyn

564 Introduction to Library Preservation *(I or II, 3)* Organization, management, principles, and techniques as they apply to the development and administration of a library preservation program. Includes causes of deterioration of materials, deacidification, and reformatting and selecting for preservation. *(Lec. 3)* Dodge

565 Rare Book Librarianship *(I or II, 3)* Organization, management, principles, and techniques as they apply to the development and administration of rare book collections. *(Lec. 3) Pre: 510 or permission of instructor.* Tryon

571 Database Management Systems for Information Services *(I or II, 3)* Provides concepts of database management systems (DBMS) for the design and use of bibliographic and nonbibliographic databases. Includes DBMS models, query processing, file organization; security, accuracy, and privacy of databases, and evaluation of DBMSs. *(Lec. 3) Pre: 548 or equivalent knowledge and permission of instructor.* Staff

591, 592, 593 Independent Work *(By appt., 1–3 each)* Supervised reading or investigation in areas of special interest to students who obtain written approval for such study prior to registration for the semester for which it is proposed. *(Independent Study) Pre: 18 hours of library science with a B average. May be repeated for a maximum of 3 credits.* Staff

595 Professional Field Experience *(I and II, 1–3)* Directed field experience applying theory to practice in libraries, information centers, and related organizations under the joint supervision of a member of the faculty and the professional staff of the cooperating institutions. *(Practicum) Pre: completion of at least 18 hours of library science with a B average. May be repeated for a maximum of 3 credits.* Staff

596 Professional Field Experience: School Library Media Practicum *(II, 6–9)* Directed field experience applying theory to practice in school library media centers under the joint supervision of a faculty member and the professional staff of the cooperating school. *(Practicum) Pre: 520 and completion of at least 18 hours of library science with a B average. 45 hours per credit.* McCarthy

597 Selected Topics *(I and II, 3)* Selected topics in library and information studies of current and special interest not covered in existing course offerings. Topics announced prior to each offering. *(Independent Study) Pre: 501 or permission of instructor.* Staff

programs, information science, automation, administration, young adult services, and library history.

Master of Library and Information Studies

Admission requirements: bachelor's degree (B average) and GRE or MAT at the 50th percentile or above. GRE or MAT waived for applicants with a master's degree. The completed application package should be received by November 15 for spring admission, April 15 for summer admission, and July 15 for fall admission.

Program requirements: 42 credits consisting of LSC 501, 502, 503, 504, 505, or 506; 27 credits of electives of which up to six may be taken in courses outside library science when relevant to the student's specialization; one course with major paper requiring significant independent research; and a written comprehensive examination. Up to 24 hours may be taken at the regional centers at the University of Massachusetts in Amherst or Boston and at the University of New Hampshire at Durham. No more than six credits or two courses may be taken in nonmatriculating status for transfer into the degree program.

Cooperative Program (M.A. in History and M.L.I.S.)

By proper selection of course work, a student may simultaneously earn the degrees of Master of Arts in history and Master of Library and Information Studies.

Admission requirements: GRE (subject test desirable) and other requirements listed for history and library science. Applicant must apply and be accepted in both programs. The application to each program must indicate history/library and information studies as the field of specialization.

Program requirements: students must submit individual programs of study for each degree that satisfy specific core requirements for these programs. Since a maximum of six credits may be jointly used to satisfy degree requirements, a minimum of 60 credits total is required to satisfy the requirements for both degrees.

Cooperative Program (M.P.A. and M.L.I.S.)

A second cooperative program permits joint enrollment in the Master of Library and Information Studies and Master of Public Administration programs. The integrated pursuit of the two degrees makes it possible for nine credits of appropriately selected course work from one program to serve as electives in the other, and for six credits to be applied in the opposite direction. Thus, when planned and taken jointly, the two programs can be completed with a total of 63 credits.

Admission requirements: GRE and other requirements listed for M.L.I.S. and M.P.A. Applicant must apply and be accepted in both programs. The application to each program must indicate M.L.I.S./M.P.A. as the field of specialization.

Program requirements: each student must complete the required core courses for both programs plus three credits of PSC 590 for the M.P.A. After consultation with, and approval of, both departments, students must file separate programs of study for each degree, indicating the courses to be jointly counted. Each student must pass the separate comprehensive examination for each degree. A student who fails to complete one of the programs may, of course, complete the other in accordance with the separate program of study.

LSC Courses Library and Information Studies

501 Foundations of Library and Information Science *(I and II, 3)* Overview of the field covering the language and literature of librarianship; the history and functions of libraries; the nature of various types of libraries, the profession, operations, and new technologies. *(Lec. 3) Pre: graduate standing or permission of instructor.* Eaton, Zipkowitz, and Carson

502 Library Administration *(I and II, 3)* The scientific analysis of library administration ranging from the community survey and formulation of goals and objectives to case studies on public and technical services, staffing and personnel, and buildings. *(Lec. 3)* Zipkowitz

503 Collection Development *(I and II, 3)* Introduction to process, practices, and problems of collection building, maintenance, and evaluation regardless of format or subject of material, type of institutional setting, or community or client group served. *(Lec. 3)* Futas and Tryon

504 Reference and Information Services *(I and II, 3)* Practical experience in the use of basic information sources with readings and discussion on the philosophy and administrative aspects of reference work. *(Lec. 3)* Gilton and Futas

505 Organization of Library Materials *(I and II, 3)* Introduction to the principles and practice of descriptive and subject cataloging and classification systems with an introduction to Library of Congress classification. Includes OCLC searching and tagging. *(Lec. 3)* Zipkowitz

506 Technical Services *(I or II, 3)* Principles and policies in the acquisition, organization, conservation, and circulation of materials in libraries and information centers. Includes examination of automation of library processes. *(Lec. 3) Pre: 501.* Zipkowitz

510 History of Books and Printing *(I or II, 3)* The art and craft of book production through the ages; printers, methods, and materials with consideration given to the role of the book in cultural development. *(Lec. 3)* Tryon

512 History of Libraries and Librarianship *(I or II, 3)* The development of libraries and librarianship within a cultural, social, and economic context from antiquity to the present. *(Lec. 3)* Tryon

513 Intellectual Freedom and Censorship *(I or II, 3)* Historical development and current status of the concept of intellectual freedom and the restraints that past and present societies have imposed on it. Special attention given to the librarian's role in defense of intellectual freedom. *(Lec. 3)* Tryon

520 School Library Media Services *(I or SS, 3)* The role of the library media specialist as teacher, information specialist, and instructional consultant, with emphasis on creating instructional programs and services in schools. Summer or fall semester prior to practicum. *(Lec. 3) Pre: completion of 21 hours including core courses, 501–505, or permission of instructor.* McCarthy

521 Public Library Service *(I or II, 3)* Methods for management and planning in public libraries for creating programs, and for evaluating services and their effects on the public served. The identification of alternative solutions to budgeting and personnel management problems. *(Lec. 3) Pre: 502.* Zipkowitz

522 College and University Library Service *(I or II, 3)* Study of the functions, organization, management, and services of college and university libraries. *(Lec. 3) Pre: 502.* Tryon and Zipkowitz

523 Special Library Service *(I or II, 3)* Organization, management, and procedures as they apply to special libraries with particular emphasis on the diversity of special library functions. *(Lec. 3) Pre: 502.* Stankus

524 Library Instruction: Philosophy, Methodology, and Materials *(II, 3)* An introduction to all aspects of instructing a diverse clientele in effective library use. Philosophy, cognition aspects, methodologies, media and administration, and coordination and evaluation of library instruction will be considered. *(Lec. 3) Pre: 504 or permission of instructor.* Gilton

528 Media in the Library *(I or II, 3)* The role of multimedia materials in library and information settings, including the selection, evaluation, organization, and utilization of audiovisual hardware and software, and an introduction to emerging communication technologies. *(Lec. 3)* Carson

529 Theory and Production of Library Media Communications *(I or II, 3)* Introduction to the design and production of graphic, photographic, audio, video, and computer-based materials for library and information environments through the application of basic communication, perception, and learning theories. *(Lec. 2., Lab. 2)* Carson

546 Alternative Dispute Resolution Processes and Applications *(I, II, or SS, 3)* Examination of mediation, fact-finding, arbitration, and other conflict resolution processes as alternatives to litigation in a variety of dispute situations, e.g., community, environmental, divorce, landlord-tenant, prison, racial, commercial. *(Lec. 3) Pre: permission of instructor.* Staff

579 (or EDC 579) Labor Relations and Collective Bargaining in Education *(I, II, or SS, 3)* Collective bargaining in public and private educational sectors, K–12, higher education; literature, theory, practice, and legal foundations in education. Comprehensive case studies will be used. *(Lec. 3)* Croasdale

580 Professional Seminar: Labor and Industrial Relations *(II, 3)* Advanced labor relations seminar of variable coverage and focus; adjusted yearly to consider most recent labor relations developments. Major research paper required. *(Sem. 3) Pre: final semester graduate standing in labor and industrial relations and permission of Labor Research Center director.* Schmidt

581 Internship: Labor and Industrial Relations *(I, II, and SS, 3–6)* Variable length internship with a trade union, a public or private sector personnel or industrial relations department, or a governmental administrative or regulatory agency, under the supervision of both an LRC faculty member and a member of the affiliated organization. May be taken as one 6-credit unit or two 3-credit units. *(Practicum) Pre: graduate standing in labor and industrial relations and permission of Labor Research Center director.* Schmidt

590, 591 Directed Readings and Research in Labor and Industrial Relations *(I, II, and SS, 3 each)* Readings and research under the direction of LRC-associated faculty to meet individual student requirements. *(Independent Study) Pre: graduate standing in labor and industrial relations and permission of Labor Research Center director and instructor.* Staff

Languages

The University offers Master of Arts degrees in comparative literature studies, French, and Spanish.

Comparative Literature Studies
M.A.

See Comparative Literature Studies on page 46.

French
M.A.

See French on page 59.

Spanish
M.A.

See Spanish on page 104.

GER Courses
German

421 Business German *(I and II, 3)*
441, 442 German Literature of the Eighteenth Century *(I and II, 3 each)*
451, 452 German Literature of the Nineteenth Century *(I and II, 3 each)*
485, 486 Special Studies *(I and II, 1–3 each)*
497, 498 Directed Study *(I and II, 1–3 each)*

586 Seminar in German Studies *(I, II, and SS, 1–3)* Topics in German literature and civilization. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated with different topics.* Staff

598 Directed Studies *(I, II, and SS, 1–3)* Individual research on problems of special interest. *(Independent Study) Pre: graduate standing, acceptance of project by a staff member, and permission of chairperson. May be repeated with different topics.* Staff

987, 988 German Play Production *(SS, 1 each)* Study and production of a German play or plays. *(Workshop) Pre: 215 and 216 or equivalent. Students may enroll concurrently in 485, 486.* Staff

GRK Courses
Greek

497, 498 Directed Study *(I or II, 1–6 each)*

ITL Courses
Italian

408 The Italian Language *(I or II, 3)*
455 Selected Italian Authors *(I or II, 3)*
465 Topics in Italian Literature *(I or II, 3)*
480 Business Italian *(I or II, 3)*
481 The Works of Dante Alighieri *(I or II, 3)*
497, 498 Directed Study *(I and II, 3 each)*

LAT Courses
Latin

497, 498 Directed Study *(I and II, 1–6 each)*

LIN Courses
Linguistics

420 Second-Language Acquisition *(II, 3)*
431 Applied Linguistics in the Language Laboratory *(I, 1)*
497, 498 Directed Study *(I and II, 3 each)*

The following are related, specialized courses in historical linguistics offered in the Department of English and in the Department of Modern and Classical Languages and Literatures.

ENG 530 History of the English Language *(I, 3)*
FRN 503 History of the French Language *(II, 3)*
ITL 408 The Italian Language *(I or II, 3)*

RUS Courses
Russian

460, 461 The Russian Novel *(I and II, 3 each)*
497, 498 Directed Study *(I and II, 3 each)*

Library and Information Studies

M.L.I.S.
401-792-2947

Graduate Faculty

Director, Graduate School of Library and Information Studies: Professor Elizabeth Futas, Ph.D., 1980, Rutgers—The State University
Assistant to the Director for Regional Studies: Associate Professor Fay Zipkowitz, D.A., 1977, Simmons College
Associate Professor C. Herbert Carson, Ph.D., 1988, Syracuse University
Associate Professor E. Gale Eaton, Ph.D., 1990, University of North Carolina, Chapel Hill
Associate Professor Leena Siitonen, Ph.D., 1985, University of Pittsburgh
Associate Professor Jonathan S. Tryon, Certificate in Advanced Librarianship, 1974, Columbia University; J.D., 1981, Suffolk University
Assistant Professor Donna Gilton, Ph.D., 1988, University of Pittsburgh
Assistant Professor Cheryl McCarthy, Ph.D., 1990, Simmons College
Associate Professor Emeritus Stewart P. Schneider, M.S., 1964, Columbia University
Assistant Professor Emerita Patricia E. Jensen, Ph.D., 1983, University of Connecticut

Specializations

The overall goal of the school is to educate librarians who will not only function effectively, but also demonstrate the capacity to affect the course of librarianship. The Graduate School of Library and Information Studies prepares students for professional service in libraries and information agencies by offering an ALA-accredited program leading to the Master of Library and Information Studies (M.L.I.S.) degree. It also provides an opportunity for students to pursue simultaneously master's degrees in library and information studies and in history or public administration. The school library media specialization is accredited by NASDTEC.

Through consultation with advisors, students prepare for careers in academic, school, public, or special libraries. They also may plan for specialization in areas such as children's service, reference and bibliography, cataloging, special collections, media

Professor Sharon H. Strom, Ph.D., 1969, Cornell University
Professor Robert Weisbord, Ph.D., 1966, New York University Graduate School
Associate Professor Laura Beauvais, Ph.D., 1987, University of Tennessee, Knoxville
Associate Professor Elizabeth Cooper, Ph.D., 1985, University of Akron
Associate Professor Diane Disney, Ph.D., 1988, Brandeis University
Associate Professor Sandra Ketrow, Ph.D., 1982, Indiana University
Associate Professor Leonard P. Lardaro, Ph.D., 1979, Indiana University
Associate Professor Blair M. Lord, Ph.D., 1975, University of California
Associate Professor Richard McIntyre, Ph.D., 1989, University of Massachusetts
Associate Professor Arthur C. Mead, Ph.D., 1978, Boston College
Associate Professor Carole Miller, Ph.D., 1988, Syracuse University
Assistant Professor Charles Latos, Ph.D., 1977, Brown University
Assistant Professor D. Scott Molloy, Ph.D., 1991, Providence College
Assistant Professor Gail A. Shea, Ph.D., 1975, Brown University
Adjunct Professor J. Michael Keating, J.D., 1973, Georgetown University Law School
Adjunct Professor Suzanne Taylor, Ph.D., 1970, University of Connecticut
Professor Emeritus Carl Gersuny, Ph.D., 1968, Western Reserve University
Professor Emeritus Elton Rayack, Ph.D., 1957, University of Chicago

The program is designed for union, government, neutral, or human resource management, labor, and industrial relations professionals, or for those students who aspire to such positions. Students in other graduate programs may find it rewarding and professionally desirable to enroll in one or more of the labor relations and labor studies courses. All courses are offered in the very late afternoon or in the evening in Providence and Kingston so that they are convenient for those currently employed. Full-time or part-time programs are available.

Master of Science

Admission requirements: GRE or MAT or GMAT. Undergraduate majors in any field will be considered for admission. Those with social science, history, management, and labor studies majors are especially encouraged to apply, as are those with engineering, nursing, education, urban affairs, black studies, and women's studies backgrounds. Professional experience in labor and industrial relations will carry additional weight in admission decisions.

Program requirements: minimum of 36 credits including 27–28 credits in core courses and nine credits of specialization plus requirements of three credits each in statistics and computer science, which may be met by prior course work or examination, and a written master's examination. The required core courses (27–28 credits) are: LRS/HIS 544; LRS/PSC 521; LRS/SOC 432 or MGT 630; LRS/ECN 526 and 534; LRS 531, 541, 542, and 580.

The areas of specialization are listed here together with available courses. Substitutions may be made with permission of the director of the Labor Research Center and approval of the Graduate School.

Labor relations: three courses from LRS 520, 533, 545, 581, 590, 591; MGT 640; and LRS 543 or 579.

Human resource administration: three courses from MGT 640; PSC 503 or MGT 641; LRS 533, 545, 581, 590, 591 and LRS 543 or 579; PSY 434; EDC 529 or 583.

Labor and worker studies: three courses from LRS 520, 545, 581, 590, 591; ENG 445; HIS 591; PSC 486; and PSY 480.

Worker/labor or management education and training: three courses from LRS/EDC 579; LRS 581; LRS 590, 591; EDC 505, 539, 581, 582, 583, 584.

International development: three courses including REN 595 and two related electives.

Alternative dispute and conflict resolution processes: three courses including LRS 545, 546, 581, 590, 591, and PSC 420 or 432.

Nondesignated specialization: three courses in an area that satisfies the student's individual professional goals—e.g., computer science or statistics; economics or social policy; law and legal processes; or workplace issues such as alcohol and drug abuse, sexual or age discrimination, or racism.

LRS Courses
Labor and Industrial Relations

432 (or SOC 432) Industrial Sociology *(I or II, 3)*

520 Labor Union Government and Structure *(I or II, 3)* Structure, functions, responsibilities, and programs of unions and union leadership. Emphasis on policies and decision making. Evaluation of labor and management performance. Consideration of administrative problems associated with growth of white collar unions. *(Lec. 3) Pre: credit or concurrent enrollment in 544.* Molloy

521 (or PSC 521) International and Comparative Trade Unions and Labor Relations *(I or II, 3)* Comparative labor and industrial relations systems, including union, management, and government functions and roles; also the functions of international organizations in labor relations. *(Lec. 3) Pre: 544 or permission of Labor Research Center director.* Rothstein or Schmidt

526 (or ECN 526) Economics of Labor Markets *(I or II, 3)* The theory of labor market behavior, and application of theory for public policy analysis in areas such as discrimination, unemployment, and education. *(Lec. 3) Pre: ECN 125 and 126 or 590 or equivalent.* Staff

531 Employment Law *(I or II, 3)* Analysis of legislation protecting worker health, employment, income security, including OSHA, workers' compensation, equal opportunity, fair labor standards, Walsh-Healy and Davis-Bacon, pension funds, unemployment compensation, and social security. *(Lec. 3) Pre: permission of Labor Research Center director.* Tabor

533 Negotiating Pension, Health, and Employee Assistance Programs *(I, II, or SS, 3)* An analysis of employee assistance plans (EAPs), health fringe benefits, and pension plans and their negotiation within both the private and public sectors. *(Lec. 3) Pre: permission of instructor and Labor Research Center director.* Staff

534 (or ECN 534) Information Sources and Uses in Labor Relations and Labor Economics *(I or II, 3)* Analysis and use of data and information sources specific to the professional fields of labor and industrial relations and labor economics. A major project utilizing personal computer software is required. *(Lec. 3) Pre: 526 and QBA 500 and 530 or permission of instructor. Not for graduate credit for M.B.A. or M.S. in accounting students.* Staff

541 Labor Relations Law *(I or II, 3)* Legal framework for private and public sector collective bargaining. Regulation of activities with emphasis on individual rights, collective rights, and policy considerations of federal and state courts, the NLRB, and state labor boards in determining society's rights. Case studies. *(Lec. 3) Pre: 544 or permission of instructor.* Grossman

542 Labor Relations and Collective Bargaining *(I or II, 3)* Collective bargaining literature, theories, and practice. Bargaining approaches, techniques, and dynamics will be stressed through the analysis of comprehensive case studies. *(Lec. 3) Pre: 541 and 544 or permission of Labor Research Center director.* Schmidt

543 Labor Relations and Collective Bargaining: Public Sector *(I or II, 3)* Public sector (state, municipal, federal, police, fire, K–12 education, and higher education) collective bargaining theory, practice, and legal foundations. Comprehensive case studies. *(Lec. 3) Pre: credit or concurrent enrollment in 542 or permission of Labor Research Center director.* Grossman

544 (or HIS 544) Colloquium in Worker History *(I or II, 3)* Selected topics in American worker history with an emphasis on the most recent literature in the field. *(Sem. 3) Pre: graduate standing or permission of instructor.* Molloy

545 Labor Dispute Settlement *(I or II, 3)* Reading, procedures, and cases in the settlement of labor disputes in both private and public sectors. Emphasis on arbitration, mediation, and fact-finding. *(Lec. 3) Pre: 541 and 542 or permission of Labor Research Center director.* Staff

Master of Science

Admission requirements: GRE and advanced test recommended; bachelor's degree with major in physics preferred.

Program requirements: PHY 510, 520, 525, 530, 560, 570, and 580 are required of all students. For both the thesis and the nonthesis options, the student will complete 30 credits, of which no more than six may be below the 500 level. For the nonthesis option, at least one course will require a substantial paper involving significant independent study, and the student must pass a final written and oral examination.

Doctor of Philosophy

Admission requirements: GRE and advanced test recommended; bachelor's degree with major in physics preferred. Master's degree is not required.

Program requirements: PHY 510, 520, 525, 530, 570, 580, 610, 625 (or 626), 630, 660, 670, and 680. There is no formal departmental language requirement, although the candidate's committee may require demonstration of language proficiency. Successful completion of a qualifying examination is required of all students.

PHY Courses
Physics

401, 402 Seminar in Physics *(I and II, 1 each)*

410 Computational Physics *(II, 3)*

420 Introduction to Thermodynamics and Statistical Mechanics *(II, 3)*

425 Acoustics *(I, 3)*

451 Introduction to Quantum Mechanics *(I, 3)*

452 Quantum Mechanics: Techniques and Applications *(II, 3)*

455 Introduction to Solid-State Physics *(I, 3)*

483, 484 (or AST 483, 484 or OCG 483, 484) Laboratory and Research Problems in Physics *(I and II, 3 each)*

491, 492 (or AST 491, 492) Special Problems *(I and II, 1–6 each)*

510 Mathematical Methods of Physics I *(I, 3)* Topics designed to include applications in physics. Vector and tensor analysis; linear algebra; coordinate systems. Determinants, matrices; introductory group theory. Infinite series, complex analysis, analytic properties, conformal mapping, calculus of residues. Fourier analysis and Laplace transforms. *(Lec. 3) Pre: permission of chairperson.* Staff

520 Classical Dynamics *(I, 3)* Newton's laws. Conservation theorems and symmetry properties. Lagrangian mechanics. Central force motion. Dynamics of rigid bodies. Hamiltonian mechanics. Canonical transformations. Action-angle coordinates. Hamilton-Jacobi theory. Deterministic chaos. Relativistic mechanics. *(Lec. 3) Pre: credit or concurrent enrollment in 510.* Staff

525 Statistical Physics I *(I, 3)* Equilibrium thermodynamics (laws of thermodynamics, thermodynamic potentials). Phase transitions (phase coexistence, Clausius-Clapeyron equation, metastable states, critical point). Kinetic theory. Equilibrium statistical mechanics (microcanonical, canonical, grandcanonical ensembles, bosons, fermions). Critical phenomena. *(Lec. 3) Pre: 420 or equivalent, 510.* Staff

530 Electromagnetism I *(II, 3)* Electrostatics, including boundary value problem. Multipoles, electrostatics of macroscopic media, dielectrics. Magnetostatics. Time-varying fields, Maxwell equations, conservation laws. Plane elctromagnetic waves, wave propagation. Wave guides, resonant cavities. Magnetic materials. *(Lec. 3) Pre: credit or concurrent enrollment in 510 and 520.* Staff

560 Experimental Methods in Condensed Matter Science *(I or II, 3)* Fundamental experiments on topics related to departmental research. Experimental methodology. *(Lec. 2, Lab. 3) Pre: 484 or equivalent.* Staff

570 Quantum Mechanics I *(II, 3)* Dirac notation. Matrix representations, observables, uncertainty relations. Time evolution; Schroedinger and Heisenberg pictures. Schroedinger equation applications. Propagators and Feynman path integrals. Aharonov-Bohm effect. Angular momentum; Wigner-Eckart theorem. *(Lec. 3) Pre: credit or concurrent enrollment in 510 and 520.* Staff

580 Condensed Matter Physics I *(I, 3)* Introductory theories. Crystal lattices (classification, reciprocal lattice, diffraction). Electron energy levels (periodic structures, tight-binding, APW, OPW approximations, pseudopotentials; Fermi surfaces). Phonons (harmonic and anharmonic effects). Dispersion. Electron-phonon interaction. *(Lec. 3) Pre: 530 or permission of chairperson.* Staff

590 Faculty Project *(I or II, 1–6)* A special project directly related to the research program of an individual faculty member. *(Independent Study). Pre: permission of chairperson. Not to exceed 6 credits.* Staff

591 Special Problems *(I or II, 1–6)* Advanced study under the supervision of a staff member arranged to suit the individual needs of the student. *(Independent Study) Pre: permission of chairperson. Not to exceed 6 credits.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

610 Mathematical Methods of Physics II *(II, 3)* Topics designed to include applications in physics. Ordinary and partial differential equations; Sturm-Liouville theory. Numerical methods and computational techniques. Probability and statistics. Integral transforms. Integral equations; Green's functions. Special functions of mathematical physics. *(Lec. 3) Pre: 510.* Staff

625 Statistical Physics II *(II, 3)* Equilibrium critical phenomena (critical exponents, scaling relations, multicritical phenomena). Exact solutions. Renormalization group theory and other approximate methods. Critical behavior of magnets, fluids, and surfaces. *(Lec. 3) Pre: 525 and 670.* Staff

626 Statistical Physics III *(II, 3)* Stochastic processes. Markov condition. Master equation. Fokker-Planck equation. Brownian motion. Langevin equation. Transport phenomena. Onsager theory of irreversible processes near equilibrium. Boltzmann equation. Linear response theory, fluctuation dissipation theorem. *(Lec. 3) Pre: 525.* Muller

630 Electromagnetism II *(I, 3)* Radiating systems, scattering, and diffraction. Special theory of relativity. Dynamics of relativistic particles and electromagnetic fields. Collisions between charged particles, energy loss and scattering. Radiation by moving charges. Multipole fields. *(Lec. 3) Pre: 530.* Staff

660 Nuclear and Particle Physics *(II, 3)* Weak, strong, and electromagnetic interactions. Nucleon-nucleon potential, shell model, optical model. Isospin, unitary symmetry, quark model of hadrons. Scattering and reaction theory of few-body systems. Deuteron. Relativistic nuclear and particle phenomena. *(Lec. 3) Pre: 570 and 670.* Staff

670 Quantum Mechanics II *(I, 3)* Symmetry (parity, translation, time-reversal). Time-independent (dependent) perturbation theory, variational methods. Identical particles. Scattering theory (Lippman-Schwinger equation, Born series, partial waves, resonances, optical theorem, inelastic scattering). Applications. Relativistic quantum mechanics. *(Lec. 3) Pre: 570 or permission of chairperson.* Staff

672 Quantum Mechanics III *(II, 3)* Atomic systems (structure, semiclassical radiation theory, collisions). Quantum fields (scalar, spin-1/2, electromagnetic). Applications: quantum field theory (Feynman diagrams in QED and weak interactions, renormalization). Fock space. Many-body theory. *(Lec. 3) Pre: 670. In alternate years. Next offered spring 1995.* Staff

680 Condensed Matter Physics II *(II, 3)* Interacting systems. Green's functions. Second quantization. Landau theory of quasi-particles. Schroedinger and Heisenberg pictures. Many-body Green's functions. Perturbation series, diagrammatic analysis. Dielectric response. Thermal properties. Phonons in metals. *(Lec. 3) Pre: 580.* Staff

690 Topics in Physics *(I or II, 3)* Advanced topics in areas of research specializations: a) neutron physics; b) quantum fluids; c) magnetism; d) surface physics; e) nonlinear phenomena; f) advanced quantum physics; g) nuclear physics; h) low-temperature physics. *(Lec. 3) Pre: permission of chairperson.* Staff

691 Advanced Special Topics *(I or II, 1–6)* Special topics related to current developments by visiting or permanent faculty. *(Lec. 1–6) Pre: permission of instructor.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Physics Topics for Teachers *(I, II, and SS, 0–3 each)* Especially designed for teachers of physical sciences. Basic topics in physics from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Staff

AST Courses
Astronomy

483, 484 (or PHY 483, 484 or OCG 483, 484) Laboratory and Research Problems in Physics *(I and II, 3 each)*

491, 492 (or PHY 491, 492) Special Problems *(I and II, 1–6 each)*

Plant Pathology

Ph.D. (Biological Sciences)
401-792-2791

Graduate Faculty

Chairperson: Professor Richard J. Hull, Ph.D., 1964, University of California
Director of Graduate Studies: Associate Professor Joel M. Chandlee, Ph.D., 1984, North Carolina State University
Professor Noel Jackson, Ph.D., 1960, University of Durham
Professor Walter C. Mueller, Ph.D., 1961, Cornell University
Associate Professor Larry Englander, Ph.D., 1973, Oregon State University
Professor Emeritus Carl H. Beckman, Ph.D., 1953, University of Wisconsin

Specializations

Plant pathology: disease resistance mechanisms, fine structure of pathogen-host interactions, epidemiology of diseases infecting turfgrasses and woody ornamental plants.

Doctor of Philosophy (Biological Sciences)

Admission requirements: GRE and, preferably, a master's degree in botany or plant pathology; GRE and undergraduate major in biological, agricultural, or physical sciences. Fundamental courses in biological sciences, mathematics, and chemistry may be required to make up deficiencies without graduate credit.

Program requirements: course work as determined by graduate committee; dissertation. For courses, see listing under Plant Sciences.

Plant Sciences

M.S., Ph.D. (Biological Sciences)
401-792-2791

Graduate Faculty

Chairperson: Professor Richard J. Hull, Ph.D., 1964, University of California
Director of Graduate Studies: Associate Professor Joel M. Chandlee, Ph.D., 1984, North Carolina State University
Associate Professor Dale T. Duff, Ph.D., 1967, Michigan State University
Associate Professor William R. Krul, Ph.D., 1967, Purdue University
Associate Professor Richard J. Shaw, Ph.D., 1966, University of Missouri
Associate Professor W. Michael Sullivan, Ph.D., 1981, University of Nebraska
Assistant Professor Brian K. Maynard, Ph.D., 1990, Cornell University
Assistant Professor Bridget A. Ruemmele, Ph.D., 1989, University of Minnesota
Adjunct Professor Raymond B. Taylorson, Ph.D., 1960, University of Wisconsin
Adjunct Assistant Professor Stephen L. Dellaporta, Ph.D., 1981, Worcester Polytechnic Institute

Specializations

Turfgrasses, woody ornamentals, and agricultural crops. Program emphasis may be developed in plant-soil nutrient relations, plant propagation including tissue culture, stress physiology, crop improvement, plant molecular biology, and the ecology of crop production. Additional areas include landscape ecology and floriculture. Specializations in soil science are available in the natural resources program.

Master of Science

Admission requirements: GRE, B.A. or B.S. degree with undergraduate courses in botany, agronomy or horticulture, chemistry, mathematics, physics, and soils passed with grades of A or B. Deficiencies in these areas must be corrected without graduate program credit. An area of interest corresponding to a field of program emphasis must be indicated. Applicants are encouraged to contact a faculty member in their area of interest who may be willing to serve as their major professor. Initial contact may be made with the chairperson of the Department of Plant Sciences.

Program requirements: thesis option—a thesis based on independent experimental research and 24 credits of course work, including PLS 501 and 502. Nonthesis option (with permission of the department at time of admission)—36 credits of course work with a minimum of 14 credits in plant science to include PLS 501 and 502 and at least one of the following: PLS 511, 512, 571, 572, or 576. Three credits in experimental statistics and a written project involving significant independent work (PLS 591 or 592) are also required. A written comprehensive examination administered by the student's major professor and two additional members of the faculty (at least one must be from the Department of Plant Sciences) is required after most courses have been taken.

Doctor of Philosophy (Biological Sciences)

Admission requirements: GRE and, normally, an M.S. in an agricultural or biological science. Applicants who are admitted without an M.S. must pass a qualifying examination after earning 18–24 credits.

Program requirements: course work as determined by the graduate committee, including PLS 501, 502; comprehensive examination; dissertation.

PLS Courses
Plant Sciences

401, 402 Plant Sciences Seminar *(I and II, 1 each)*

405 Propagation of Plant Materials *(II, 3)*

415 Theories and Practices in Therapeutic Horticulture *(II, 3)*

436 Floriculture and Greenhouse Crop Production *(II, 4)*

440 Diseases of Turfgrasses, Trees, and Ornamental Shrubs *(II, 3)*

441 Plant Disease Laboratory *(I, 1)*

442 Professional Turfgrass Management *(II, 3)*

461 Weed Science *(I, 3)*

463 Principles of Plant Disease Control *(II, 3)*

471 Plant Improvement I *(I, 3)*

472 Plant Improvement II *(II, 3)*

475 (or NRS 475) Plant Nutrition and Soil Fertility *(II, 4)*

476 Environmental Plant Physiology *(II, 3)*

484 (NRS) Structures *(II, 3)*

491, 492 (or LAR 491, 492) Special Projects and Independent Study *(I and II, 1–3 each)*

501, 502 Graduate Seminar in Plant Sciences *(I and II, 1 each)* Presentation of technical reports and discussion of current research papers in crop science, landscape ecology, growth and development of economic plants, and production, protection, and management of economic crops. *(Seminar) Pre: permission of instructor.* Staff

511 The Nature of Plant Disease *(I, 3)* Analysis of the nature of plant disease, the processes of infection and pathogenesis, and the structural and physiological responses that determine resistance to disease. *(Lec. 3) Pre: BOT 332 or equivalent. In alternate years. Next offered 1995–96.* Staff

512 Plant Growth and Development *(II, 4)* Environmental, chemical, and genetic regulation of plant development, from seed formation to senescence. *(Lec. 3, Lab. 3) Pre: BOT 245. In alternate years, next offered 1995–96.* Krul

513 Laboratory Plant Tissue Culture *(II, 1)* Techniques for initiation and continuous culture of plant cells; protoplast isolation, fusion, and selection; micropropagation, somatic embryogenesis, and production of haploid plants via pollen and anther culture. *(Lab. 3) Pre: BOT 245, concurrent enrollment in 472, and permission of instructor. In alternate years. Next offered 1995–96.* Krul

572 (or BCH 572) Plant Biochemistry *(I, 3)* Physiological chemistry unique to plants. Emphasis on energy acquiring, transferring, and storing reactions including the metabolism of carbohydrates, amino acids, lipids, phenolics, and phytohormones. *(Lec. 3) Pre: BCH 311 or 581 or permission of instructor. In alternate years. Next offered 1994–95.* Hull

591, 592 Nonthesis Research in Plant Sciences *(I and II, 1–3 each)* Advanced work under the supervision of research staff to expand research experience into areas other than those related to thesis research. Arranged to suit individual requirements. *(Independent Study) Pre: permission of instructor.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Note: For other related courses, see BOT 332, 432, 437, 453, 521, 524, 546, 554, MIC 552, and ZOO 581, 586.

Political Science

M.A., M.P.A.
401-792-2183

Graduate Faculty

Chairperson: Professor Gerry R. Tyler, Ph.D., 1972, Yale University
Professor Timothy M. Hennessey, Ph.D., 1968, University of North Carolina
Professor Alfred G. Killilea, Ph.D., 1969, University of Chicago
Professor Edgar C. Leduc, Ph.D., 1963, Indiana University
Professor Lawrence Rothstein, Ph.D., 1976, University of Massachusetts
Professor Arthur Stein, Ph.D., 1965, University of Pennsylvania
Professor Norman L. Zucker, Ph.D., 1960, Rutgers—The State University
Associate Professor Cynthia M. Hamilton, Ph.D., 1980, Boston University
Assistant Professor Marc A. Genest, Ph.D., 1992, Georgetown University
Assistant Professor Maureen Moakley, Ph.D., 1984, Rutgers—The State University
Assistant Professor Nicolai N. Petro, Ph.D., 1984, University of Virginia
Adjunct Professor William E. Hudson, Ph.D., 1976, Brown University
Adjunct Professor Mark S. Hyde, Ph.D., 1972, Michigan State University
Adjunct Professor Victor L. Profughi, Ph.D., 1967, University of Pittsburgh
Adjunct Associate Professor Francis J. Leazes, Jr., Ph.D., 1984, University of Connecticut

Master of Arts

Specializations: international relations, comparative politics, American politics, and public policy.

Admission requirements: GRE, GMAT, or MAT, and undergraduate credit in basic political science and political theory.

Program requirements: a minimum of 30 credits including PSC 553, 580, and 583 for both thesis and nonthesis options; nonthesis option requires one course including a substantial paper requiring significant independent research and an oral examination in addition to comprehensive examination.

Master of Public Administration

The Rhode Island Master of Public Administration Program (RIMPA) leads to the M.P.A. degree conferred by the University of Rhode Island. It is a collaborative undertaking, governed and offered by a committee of university faculty that includes adjunct faculty from Rhode Island College and Providence College. The RIMPA is offered at URI's Providence Campus and provides federal, state, and city officials and agencies easy access to its instructional programs and research expertise. In addition to delivering its degree and certificate programs, internships, and workshops, the RIMPA faculty conducts research into the formation and implementation of public policy and the administration of public and nonprofit agencies. Current research areas include public professional ethics, the training of public managers, water resource management, the governance and financing of nonprofits, state prison administration, the public administration of technology, industrial policy at the state and national levels, and case management in mental health agencies.

Admission requirements: generally, GRE, MAT, or GMAT at 50th percentile or above, and undergraduate credit in basic political science.

Program requirements: nonthesis—one course including a substantial paper requiring significant independent research; comprehensive examination; internship; minimum total of 36 credits including PSC 501, 502, 503, 505, 506, 524, and 573. Competency in computer science and statistics is required and may be demonstrated by completion of a basic course at the undergraduate level.

Cooperative Program (M.P.A. and M.L.I.S.)

A cooperative program permits joint enrollment in the Master of Library and Information Studies and the Master of Public Administration programs. The integrated pursuit of the two degrees makes it possible for nine credits of appropriately selected course work from one program to serve as electives in the other, and for six credits of such course work to be applied in the opposite direction. Thus, when planned and taken jointly, the two programs can be completed with a total of 63 credits.

Admission requirements: GRE and other requirements listed for M.L.I.S. and M.P.A. Applicant must apply and be accepted in both programs. Applications to both programs must indicate M.L.I.S./M.P.A. as the field of specialization.

Program requirements: Each student must complete the required core courses for both programs plus three credits of PSC 590 for the M.P.A. After consultation with, and approval of, both departments, students must file separate programs of study for each degree, indicating the courses to be jointly counted. Each student must pass the separate comprehensive examination for each degree. A student who fails to complete one of the programs may, of course, complete the other in accordance with the separate program of study.

PSC Courses
Political Science

401 Comparative European Politics *(I or II, 3)*
402 Environmental Policy and Politics *(I, 3)*
403 Global Ecopolitics *(II, 3)*
405 The Indian Political System: Tradition and Modernity *(II, 3)*
406 Russian Foreign Policy *(II, 3)*
407 Politics of the Russian Commonwealth *(II, 3)*
408 African Governments and Politics *(I, 3)*
410 (or AAF 410) Issues in African Development *(I or II, 3)*
420 Nonviolence and Change in the Nuclear Age *(I, 3)*
422 Comparative American State Politics *(II, 3)*
431 International Relations *(I, 3)*
432 International Government *(II, 3)*
434 American Foreign Policy *(II, 3)*
440 The Politics of Being Mortal *(I or II, 3)*
443 Twentieth-Century Political Theory *(I, 3)*
455, 456 Directed Study or Research *(I and II, 3 each)*
461 The American Presidency *(I, 3)*
466 (or AAF 466) Urban Problems *(II, 3)*
471 Constitutional Law *(I, 3)*
472 Civil Liberties *(II, 3)*
474 (or SOC 474) Criminal Justice System *(II, 3)*

481, 482 Political Science Seminar *(I or II, 3 each)*
483 Political Process: Policy Formulation and Execution *(I or II, 3)*
486 Cooperative Communities *(II, 3)*
491 Principles of Public Administration *(I, 3)*
495 Comparative Urban Politics *(I, 3)*
498 Public Administration and Policy Formulation *(II, 3)*

501 Administrative Theory *(I or II, 3)* Theoretical constructs and models in fields of public administration; theories of Weber, Riggs, Dorsey, Simon, Presthus. Lower-level models in subfields of organization, communications, and decision making. Task-oriented subject matter such as personnel, budget, and program administration related to theoretical formulations which seek to explain them. *(Lec. 3) Pre: 491 or permission of instructor.* Staff

502 Techniques of Public Management *(I or II, 3)* Principles and techniques employed in the administration of staff activities of the public service, such as administrative planning, project scheduling, and budgeting. *(Lec. 3) Pre: 491 or permission of instructor.* Staff

503 Problems in Public Personnel Administration *(I or II, 3)* Development of personnel administration, including problems of recruitment, examination, promotion, and staffing within public service. Emphasis on evaluation of employee performance and collective bargaining in public service. *(Lec. 3) Pre: graduate standing or permission of instructor.* Staff

504 Ethics in Public Administration *(I, 3)* This course explores through case studies, class discussion, films, and readings how ethical deliberation in the public sector is an essential commitment and skill for public administrators. *(Seminar) Pre: graduate standing or permission of instructor.* Killilea or Vocino

505 (or SOC 505) Public Program Evaluation *(I or II, 3)* Research design and methodologies associated with the evaluation of governmental programs and activities. *(Lec: 3) Pre: STA 308 or equivalent or permission of instructor.* Staff

506 Seminar in Budgetary Politics *(I, 3)* Examination of federal, state, and local fiscal and budgetary processes, focusing on the politics of the budgetary process and models of budgeting, with emphasis on contemporary issues. *(Seminar)* Staff

512 Marine Science and Policy Analysis
See Marine Affairs 512.

521 International and Comparative Trade Unions and Labor Relations
See Labor Studies 521.

522 Issues in Corrections
See Sociology 522.

523 Seminar in Comparative Public Administration *(I or II, 3)* Theory, practice, and organization of selected European and developing nations' administrative systems. Analysis of selected policies. Influence of English and French systems on developing systems. Structure-function and ecological analysis. *(Seminar) Pre: 491, 501, or permission of instructor.* Staff

524 Seminar in Public Policy Problems *(I or II, 3)* In-depth exploration of selected problems of policy formulation—intergovernmental relations, regionalization, citizen participation and control, priority setting for public sector programs. *(Seminar) Pre: 491, 501, or permission of instructor.* Staff

531 Behavior Systems in Crime
See Sociology 521.

544 Democracy and Its Critics *(I or II, 3)* Seminar examining the roots of modern democracy in the social contract theories and analyzing the quality and limits of self-determination in these theories in the light of contemporary politics. *(Lec. 3) Pre: 341, 342, or permission of instructor.* Killilea

546 Peace and World Order Studies *(II, 3)* This seminar explores various approaches globally to peacebuilding, world order, and community. Emphasizes conflict resolution, from local to transnational levels, and the search for social justice and human unity. *(Seminar) Pre: 420 or permission of instructor.* Stein

553 Scope and Methods of Political Science *(I, 3)* Study of political science as a discipline, its development in relation to other social sciences, and survey of political theories, concepts, and analytic models. *(Seminar) Pre: graduate standing.* Leduc

555, 556 Directed Study or Research *(I or II, 3 each)* Special work arranged to meet the individual needs of graduate students in political science. *(Independent Study) Pre: permission of chairperson.* Staff

568 Jurisprudence *(II, 3)* Introduction to the philosophy of law, treating the sources, the nature, and the consequences of major systems of legal thought. Emphasis on the relationship between legal reasoning and judicial decision making in the United States. *(Lec. 3) Pre: 471, 472, or permission of instructor.* Staff

573 Administrative Law *(I or II, 3)* Legal aspects of interaction between government agencies, individuals, and public interest groups. Systematic analysis of leading cases, evaluating the courts as an instrument for protecting the individual's rights in administrative action. *(Lec. 3) Pre: 113.* Rothstein

577 International Ocean Law
See Marine Affairs 577.

580 Seminar in International Relations Theory *(I or II, 3)* A critical treatment of major international relations theories beginning with an analysis of core theoretical concepts. *(Seminar) Pre: honors seniors with permission of instructor or graduate standing.* Genest or Petro

581, 582 Special Topics Seminar *(I, II, or SS, 3 each)* Master's-level seminar on special topics in political science not regularly covered in other courses. Content indicated by descriptive title following colon. May be repeated up to five times for a total of 15 credits with different topic. *(Seminar) Pre: graduate or senior standing in political science or permission of instructor.* Staff

583 Seminar in American Politics *(I or II, 3)* Critical consideration of central issues in American political institutions, behavior, and policy making. *(Seminar) Pre: honors seniors with permission of instructor or graduate standing.* Zucker or Moakley

590 Internship in Public Administration *(I or II, 3–6)* Participation at an administrative agency under supervision of agency head and a faculty member. Planning, personnel management, research organization, budgeting, interdepartmental relations, informal liaisons that are the hallmark of effective administration. *(Practicum) Pre: permission of M.P.A. director. May be taken as one 6-credit unit or two 3-credit units.* Staff

595 Problems of Modernization in Developing Nations
See Resource Economics 595.

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Psychology

M.S., Ph.D.
401-792-2193

Graduate Faculty

Chairperson: Professor Janet Kulberg, Ph.D., 1967, George Peabody College, Vanderbilt University
Professor Allan Berman, Ph.D., 1968, Louisiana State University
Professor Henry B. Biller, Ph.D., 1967, Duke University
Professor Jerry L. Cohen, Ph.D., 1973, University of Illinois
Professor Charles E. Collyer, Ph.D., 1976, Princeton University
Professor David Faust, Ph.D., 1979, Ohio University
Professor Paul R. Florin, Ph.D., 1981, George Peabody College, Vanderbilt University
Professor Richard J. Gelles, Ph.D., 1973, University of New Hampshire
Professor Lawrence C. Grebstein, Ph.D., 1964, University of Kentucky
Professor Ira Gross, Ph.D., 1967, University of Illinois
Professor Albert J. Lott, Ph.D., 1958, University of Colorado
Professor Bernice Lott, Ph.D., 1954, University of California, Los Angeles
Professor James O. Prochaska, Ph.D., 1969, Wayne State University

Professor Kathryn Quina, Ph.D., 1973, University of Georgia
Professor Albert Silverstein, Ph.D., 1963, University of California, Berkeley
Professor Nelson F. Smith, Ph.D., 1963, Princeton University
Professor John F. Stevenson, Ph.D., 1974, University of Michigan
Professor Dominic Valentino, Ph.D., 1971, University of California, Riverside
Professor Wayne F. Velicer, Ph.D., 1972, Purdue University
Professor Alan Willoughby, Ph.D., 1959, University of Connecticut
Associate Professor Susan A. Brady, Ph.D., 1975, University of Connecticut
Associate Professor Lisa Lavoie Harlow, Ph.D., 1985, University of California, Los Angeles
Associate Professor Patricia J. Morokoff, Ph.D., 1980, State University of New York, Stony Brook
Associate Professor W. Grant Willis, Ph.D., 1984, University of Georgia
Research Associate Professor Joseph Fava, Ph.D., 1990, University of Rhode Island
Research Associate Professor Joseph S. Rossi, Ph.D., 1984, University of Rhode Island
Assistant Professor Shanette Harris, Ph.D., 1989, Virginia Polytechnic Institute
Assistant Professor Laurie Ruggerio, Ph.D., 1988, Louisiana State University
Adjunct Professor David Abrams, Ph.D., 1981, Brown University
Adjunct Professor John J. Colby, Ph.D., 1974, University of Rhode Island
Adjunct Associate Professor Douglas Bernon, Ph.D., 1982, American University; Ph.D., 1987, California School of Professional Psychology
Adjunct Associate Professor Gerald Groden, Ph.D., 1963, Purdue University
Adjunct Associate Professor J. Eugene Knott, Ph.D., 1975, University of Maryland
Adjunct Associate Professor Roger Mitchell, Ph.D., 1980, University of Maryland
Adjunct Associate Professor Peter Monti, Ph.D., 1974, University of Rhode Island
Adjunct Assistant Professor Stephen L. Buka, Sc.D., 1988, Harvard School of Public Health
Adjunct Assistant Professor Denise DeZolt, Ph.D., 1992, Kent State University
Adjunct Assistant Professor Bette LaSere Erickson, Ed.D., 1976, University of Massachusetts
Adjunct Assistant Professor E. Grace Frenzel, Ph.D., 1979, Colorado State University
Adjunct Assistant Professor Ann Varna Garis, Ph.D., 1977, University of Rhode Island
Adjunct Assistant Professor Diane J. Goodman, Ed.D., 1989, University of Massachusetts
Adjunct Assistant Professor June Groden, M.A., 1980, Boston College
Adjunct Assistant Professor Thomas J. Guilmette, Ph.D., 1982, University of Missouri
Adjunct Assistant Professor Katherine C. Haspel, Ph.D., 1981, University of Rhode Island
Adjunct Assistant Professor Robert LaForge, Sc.D., 1987, Johns Hopkins University
Adjunct Assistant Professor Judith Lubiner, Ph.D.,1989, University of Rhode Island
Adjunct Assistant Professor Barry Plummer, Ph.D., 1981, University of Rhode Island
Professor Emeritus Peter F. Merenda, Ph.D., 1957, University of Wisconsin
Professor Emeritus William T. Vosburgh, Ph.D., 1965, Syracuse University

Specializations

Programs are offered in clinical, experimental, and school psychology. Specializations are offered within each program. The clinical program encourages students to organize their courses so as to foster their developing career needs. Thus, one is encouraged to develop specific interests and competencies in areas such as health psychology, substance abuse, child/clinical, community, neuropsychology, applied methodology, gender issues, and family systems. Students in the experimental program tend to concentrate in one of the following five areas: 1) human perception and learning; 2) conditioning and behavior change; 3) psychophysiology; 4) methodology and quantitative psychology; and 5) personality/social/community bases of behavior. Additional individual specialties can be developed within each of the program areas.

Master of Science (School Psychology Only)

Admission requirements: GRE, advanced test recommended. Undergraduate major in psychology recommended. Applicants are admitted for September only. The completed application package must be received by February 15.

Program requirements: nonthesis—internship; total of 60 credits with a minimum of 30 for the master's degree plus additional credits for certification as a school psychologist; one course with a major paper involving significant independent research; and a written comprehensive examination.

This program is accredited by NCATG/NASP and NASDTEC, and meets the requirements for certification in Rhode Island.

Doctor of Philosophy (Clinical, Experimental, and School Psychology)

Admission requirements: GRE, advanced test recommended; evidence of research competency. Applicants are admitted for September only. The completed application package must be received by January 20 for clinical, by February 15 for school, and by March 15 for experimental. Prospective applicants are asked to address initial inquiries concerning the desired specialization to the department. The formal application materials can be obtained from the Graduate School Office, but the completed application package must be sent to the department. Applicants to the clinical and school programs are evaluated on the basis of previous academic achievement, GRE scores, previous life experience, previous applied clinical and research experience, letters of recommendation, personal interview, and projected balance between applicant and program needs.

Due to limited facilities, new admissions to the doctoral programs must be limited to a small number per year. Finalists in the school and clinical specialization must participate in a personal interview to complete the evaluation process. Although test scores and cumulative averages are not the sole criteria for admission for the clinical program, those with overall quality point averages of less than 3.00 (on a 4.00 scale), or whose verbal and quantitative GRE scores do not total above 1200, are advised that there is little chance for admission.

Program requirements: completion of a minimum of 90 credits (72 plus 18 for dissertation). Language requirement optional depending on requirements set forth by the student's program committee. Research course requirements—a minimum of two courses in statistics (PSY 510/532) and a research methods course (PSY 611). The research competency requirement may be met by successfully defending a master's thesis or by successfully completing a research competency project under the direction of the major professor. The research competency project option is limited to those who have nonthesis master's degrees in psychology. Students who successfully complete the thesis option will earn a Master of Arts degree in psychology. A Ph.D. qualifying examination is required of all doctoral students entering without the master's degree. This requirement is met by completing four core courses from PSY 532, 533, 611, and those numbered 601–609, with a grade of B or better. These courses are usually completed prior to earning 24–30 credits. For students in the applied areas (clinical and school), at least one core course must be completed in each of the following content areas of psychology: biological bases of behavior; cognitive and affective bases; social bases; individual differences; and history and systems of psychology.

The objective of our Ph.D. program is to give our students the knowledge and skills they will need to be effective psychologists in their chosen area. Scientific training and research experience as well as knowledge and technical skills are a part of each student's program, but his or her program is individually designed around his or her needs and goals.

Both the clinical and the school psychology programs are accredited by the American Psychological Association. Both programs subscribe to the scientist-practitioner model, and thus course requirements are consistent with maintaining such accreditation. Practicum and individual research projects can be specifically tailored to help the student prepare for the professional role of his or her choice. These programs also have a strong experiential base, including field activity in each year. Students are expected to be involved in research for a substantial portion of their program.

The department emphasizes a close working relationship between faculty and students. No single theoretical or philosophical model is espoused.

PSY Courses
Psychology

405 (or APG 405) Psychological Anthropology *(I or II, 3)*
432 Advanced Developmental Psychology *(II, 3)*
434 Psychological Testing *(I and II, 3)*
436 (or PCL 436) Psychotropic Drugs and Therapy *(II, 3)*
442 The Exceptional Individual *(I and II, 3)*
456 Research Methods in Social Psychology *(II, 4)*
460 The Substance-Troubled Person *(I, II, and SS, 3)*
464 Humanistic Psychology *(II, 3)*
465 Introduction to Crisis Intervention *(I or II, 3)*
470 Topics in Social Psychology *(I, 3)*
471 Applied Behavioral Analysis and Remediation *(II, 3)*
473 Practicum in Behavioral Psychology *(I or II, 3)*
479 Contemporary Problems for Modern Psychology *(I and II, 3–12)*
480 The Female Experience *(II, 3)*
489 Problems in Psychology *(I and II, 3)*
499 Psychology Practicum *(I and II, 1–6)*

505 Community Psychology *(I, 3)* Introduction to community psychology; study and change of individual's interaction with community systems; theoretical and empirical models, intervention strategies, and research methods relevant to community psychology. *(Lec. 3) Pre: permission of chairperson.* Florin

517 (or STA 517) Small N Designs *(II, 3)* A survey of Small N experimental methodology, including hypothesis of quasi-experimental designs and the application of interrupted time series. Applications in applied research, particularly behavioral intervention. *(Seminar) Pre: 532 and 533. In alternate years.* Velicer

522 Behavioral Assessment Techniques *(II, 3)* Interview, observational, questionnaire, self-monitoring, cognitive behavior modification, and analogue assessment procedures are reviewed in terms of their use and interpretation of behavior in clinical, institutional, home, and school settings. *(Lec. 3) Pre: 434 and 550. Offered in odd-numbered years.* Staff

532 Experimental Design
See Statistics 532.

533 Advanced Quantitative Methods in Psychology *(II, 3)* Advanced quantitative methods applied to psychology. Survey of methods such as multiple regression, multivariate analysis of variance, discriminate analysis, canonical correlation, principal component analysis, and factor analysis. Applications involve BMDP, SAS, or SSPS computer programs. *(Lec. 2, Lab. 2) Pre: 532.* Velicer or Harlow

540 (or EDC 540) Learning Disabilities: Assessment and Intervention *(SS, 3)* Applications of early screening batteries; remedial programs for various disabilities, developing treatment exercises, behavioral programs, and programs for older children and adolescents. Emphasis on pragmatic application of skills for detection and treatment. *(Lec. 3) Pre: permission of instructor. May be repeated as A and B for a maximum of 6 credits.* Berman

544 The Psychological Bases for Reading Disorders *(I or II, 3)* An in-depth review of research on factors related to reading ability. Topics include linguistic requirements, perceptual and neurological factors, implications for screening and instruction. *(Lec. 3) Pre: graduate standing or permission of instructor.* Brady

550 Operant Analysis of Behavior *(I or II, 3)* Introduction to the principles of operant conditioning with emphasis on the use of these principles in the analysis of behavior. *(Lec. 3)* Smith

554 Alternate Therapies *(I or II, 3)* Theory and practice of those individual and group techniques which can be integrated into one's present style of helping: a) existential, b) body therapies, c) cognitive therapies, and d) other contemporary approaches. Students may participate in a maximum of five distinct workshops. *(Lec. 2, Lab. 2) Pre: professional and/or graduate standing and permission of the coordinator.* Staff

581 Psychological Aspects of a Healthy Lifestyle
See Physical Education 581.

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

601 Physiological Psychology *(II, 3)* An advanced consideration of physiological research on neural, endocrine, and response systems as they relate to attention, motivation, emotion, memory, and psychological disorders. *(Lec. 2, Lab. 2)* Valentino

602 Learning and Motivation *(II, 3)* Empirical and theoretical analysis of the basic principles of acquisition and loss of habits. Topically organized to deal with respondent and operant conditioning, and their relationship to reinforcement and motivation. *(Lec. 3) Pre: undergraduate learning course.* Silverstein and Staff

603 Development *(II, 3)* Theoretical, methodological, and applied issues in lifespan development, including cognitive, perceptual, psychomotor, affective, and social development. Topically organized. *(Lec. 3)* Kulberg, Biller, and Staff

604 Cognitive Psychology *(I, 3)* A survey of the theoretical and methodological issues in human cognition. Topics include pattern recognition, attention, memory, language, problem solving. *(Lec. 3)* Brady and Staff

605 Personality *(I or II, 3)* Reading of primary source materials from major personality theorists relevant to a particular topical emphasis. Application and comparative evaluation of the theories studied. *(Lec. 3)* Stevenson and Staff

606 Social Psychology *(I, 3)* Intensive exploration of the methods, theory, and database of contemporary social psychology focusing on salient issues that clarify significant topics in this area. *(Lec. 3)* A. Lott and Staff

607 Advanced Psychopathology *(I or II, 3)* Empirical literature with regard to etiological factors involved in the formation of pathological character trends and deviations. Evaluation of clinical theory and classification systems as related to the psychotherapeutic process. *(Lec. 3)* Grebstein and Staff

608 Theories and Systems *(I, 3)* An in-depth analysis of the origin and logical structure of major systematic approaches to psychology. Emphasis on significant recurrent controversies. *(Lec. 3) Pre: graduate standing.* Collyer or Silverstein

609 Perception *(I or II, 3)* A survey of topics in the psychology of perception, including sensory function; psychophysical models, measurement, and scaling; visual perception; and methods for analyzing perceptually guided behavior. *(Lec. 3)* Collyer

610 (or STA 610) Parsimony Methods *(I, 3)* Multivariate procedures designed to reduce the dimensionality and help in the interpretation of complex data sets. Methods include principal components analysis, common factor analysis, and image analysis. Related methods: cluster analysis and multidimensional scaling. Applications involve the use of existing computer programs. *(Lec. 3) Pre: 533 or STA 541 or equivalent. In alternate years. Next offered 1994–95.* Velicer

611 Methods of Psychological Research and Experimental Design *(I, 3)* Provides the student of psychology with a knowledge of research methodology and the techniques of experimental designs. It prepares for the development of thesis problems of graduate students in psychology and related disciplines. *(Lec. 3) Pre: 532 and 533.* Staff

612 (or STA 612) Structural Modeling *(II, 3)* Theory and methodology of path analysis with latent variables. Discussion of "causation" and correlation, Confirmatory Factor Analysis, Measurement and Structural Equation models. Practical applications utilizing LISREL, EQS, and PLS computer programs. *(Lec. 3) Pre: 533 or 610.* Harlow and Velicer

615 Collaborative Research in Psychology *(I or II, 0–3)* Collaborative approaches to psychological research. Special emphasis on topics that can involve students at varying levels of research skill. Format includes weekly topical seminar and biweekly colloquium combining all topical interest groups. *(Seminar) Pre: 300, 301, 532, or equivalent and permission. May be repeated for a maximum of 6 credits. S/U credit.* Kulberg and Staff

625 Seminar: Social Psychology *(II, 3)* Emphasis on a major area in contemporary social psychology. Empirical studies analyzed for their relevance to theoretical and applied issues; students will design an original investigation. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated for a maximum of 6 credits with different topic.* A. Lott, B. Lott, J. Cohen, and J. Stevenson

641 Introduction to Psychotherapy *(I, 3)* A transtheoretical analysis of the major systems of psychotherapy. Developing an integrative, eclectic model through identifying the processes of change that are the core of effective therapy. *(Lec. 3)* Prochaska

642 Introduction to Psychotherapy Practice *(II, 3)* Instruction and practice in the basic interviewing skills and clinical techniques necessary for practicum courses in psychotherapy. Seminar format with some lecture material, role playing, structured experiential exercises, case presentation, and discussion and videotape illustration. *(Seminar) Pre: 641 and permission of instructor. S/U credit.* Grebstein or Morokoff

644 Family Therapy *(I, 3)* Introduction to theories and techniques of family assessment and family therapy. Seminar format with videotape illustrations, case presentation and discussion, role playing, lecture, and selected experiential exercises. *(Lec. 3) Pre: permission of instructor.* Grebstein

645 Marital and Sexual Therapy *(I, 3)* Behavioral, psychodynamic, and systems perspective on marital and sexual problems and treatments. Theory and research applied in supervised practice with troubled couples. *(Lec. 3)* Staff

646 Group Therapy *(I, 3)* Theory, research, and change strategies developed in working with small groups. Current research, models, and techniques will be discussed in the context of actual clinical work with groups. *(Lec. 3) Pre: permission of instructor. In alternate years.* Grebstein

647 Child Therapy *(I, 3)* Seminar discusses issues, techniques, and research related to behavior changes in children and their families. Aspects of therapy, the role of behavioral approaches, and the participation of parents will be explored. Direct, supervised experience is included in this course. *(Lec. 3) Pre: participation in the Psychological Consultation Center.* Staff

661 Psychological Services I: Administration and Interpretation of Cognitive Tests *(I, 3)* Instruction and practice in administration and interpretation of cognitive tests; individual intelligence tests of both general and specific abilities. Rationale, research evidence, clinical application of Stanford-Binet, Wechsler, McCarty scales. *(Lec. 2, Lab. 2)* Berman and Willis

662 Psychological Services II: Administration and Interpretation of Personality Tests *(II, 3)* Instruction and practice in the administration and interpretation of instruments used in the assessment of personality. Emphasis on projective tests such as Rorschach, TAT. Rationale, research evidence, and clinical application. *(Lec. 2, Lab. 2)* Berman and Staff

664 Advanced Diagnostic Problems *(II, 3)* Use and interpretation of cognitive, projective, and neural psychological tests. Focus on integrating data into meaningful description of total personality functioning. Use of the diagnostic interview. *(Lec. 3) Pre: 661, 662, and permission of instructor. In alternate years.* Berman

665 Child Psychopathology *(II, 3)* Issues in the classification of disordered behavior will be related to diagnostic and treatment considerations from early childhood through adolescence. Emphasis will be placed upon synthesizing knowledge about the psychological, developmental, and educational factors which affect disordered child behavior. *(Lec. 3) Pre: 660. In alternate years. Next offered 1995–96.* Berman

666 Seminar: Ethical and Legal Issues in Psychology *(I or II, 3)* Ethical, legal, and professional issues as they relate to the provision of psychological services and psychological research. Emphasis is on the study of ethical issues and the examination of the development of professional standards as they relate to the areas of clinical psychology practice, school psychology practice, and applied research practice. *(Seminar)* Staff

668 School Psychological Consultation *(II, 3)* Historical and contemporary perspectives on consultation are discussed in terms of mental health and psychoeducational services. The focus is on the content and process of consultation in various clinical and educational settings. *(Lec. 3) Pre: 666 or equivalent.* Staff

670 Field Experience in Psychological Services *(I and II, 1–12)* Training placements and internships are available in a variety of institutional agencies and school settings under supervision which must be acceptable to the department: (a) school, (b) experimental areas, (c) clinical. *(Practicum) Pre: permission of chairperson. S/U credit.* Staff

672 Individual Clinical Practicum *(I or II, 3–9)* Introductory experience in dealing with clinical problems in a variety of clinical settings. Individual supervision to be arranged. *(Practicum) Pre: 661, 662. May be repeated for a maximum of 9 credits. S/U credit.* Staff

674 Clinical Practices: Therapy *(I or II, 1–12)* Specialized techniques of clinical interviewing, counseling, and psychotherapy. Critical discussions of student's own supervised therapy sessions: a) individual, b) behavior, c) sensitivity, d) specialized techniques. *(Practicum) Pre: 640, 660, 673. May be repeated for a maximum of 12 credits.* Staff

676 Neurological Correlates of Psychopathology *(II, 3)* Functioning and physiology of the central nervous system with particular attention to determining how neurological disruption and injury are manifested in behavioral disorder. Techniques used to evaluate and interpret neuropsychological functioning. *(Lec. 2, Lab. 2) Pre: permission of instructor. In alternate years. Next offered 1995–96.* Berman

680 School Practices I: Diagnostic *(I and II, 3–9)* Testing procedures and devices in the diagnosis of organicity, personality problems, special learning problems, visual, auditory, and memory problems; includes administration, interpretation, and special adaptation of tests in the school situation. *(Practicum) Pre: 434, 661. May be repeated for a maximum of 9 credits.* Staff

681 Special Problems in School Psychology *(I or II, 3–9)* Role of the psychologist in the school setting. Several theoretical and practical issues concerned with the value of psychological theory, administrative philosophy, and school organization are explored. *(Seminar) Pre: 680 and permission of chairperson. May be repeated for a maximum of 9 credits.* Vosburgh and Staff

683 Psychology of the Exceptional Child *(I, 3)* Social, psychological, and educational factors that constitute the matrix of concerns with the exceptional individual in the school and community. Recent innovations in public and private education and habilitation. Research issues and legislation discussed evolve into student studies. *(Lec. 3)* Gross

687 Seminar: Topics in the Psychology of the Exceptional Individual *(I or II, 3)* Survey of topics and current issues in the treatment, needs, and understanding of the psychology of specific exceptionalities. *(Seminar) Pre: 683. May be repeated for a maximum of 9 credits with different topics.* Staff

690 Seminar: Contemporary Issues in Psychology *(I and II, 3–12)* Recent developments and current issues. Rigorous exploration of experimental and theoretical literature. Study limited each semester to one of the following areas: developmental, clinical, motivation, perception, psychophysics, and scaling problem solving and thinking. *(Semi-*

nar) May be repeated for a maximum of 12 credits. Staff

692, 693 Directed Readings and Research Problems *(I or II, 3–6 each)* Directed readings and advanced research work under the supervision of a staff member arranged to suit the individual requirements of the students. *(Independent Study)* Staff

695 Seminar: Teaching Psychology *(II, 3)* Primarily a seminar in the teaching of psychology at the undergraduate level. Includes a consideration of general issues in college teaching, preparation of a course proposal, and sample presentation. *(Seminar)* Quina, Stevenson, and Staff

696 Practicum: Teaching Psychology *(I or II, 3)* Practicum for students teaching a college-level psychology course. Supervision of course preparation, presentation, and evaluation. Individual supervision to be arranged. *(Practicum) S/U credit.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.* Staff

Resource Economics

M.S.
401-792-2471

Graduate Faculty

Chairperson: Professor Thomas F. Weaver, Ph.D., 1966, Cornell University
Director of Graduate Studies: Professor James J. Opaluch, Ph.D., 1979, University of California, Berkeley
Professor James L. Anderson, Ph.D., 1983, University of California, Davis
Professor John M. Gates, Ph.D., 1969, University of California
Professor Thomas A. Grigalunas, Ph.D., 1972, University of Maryland
Professor Jon G. Sutinen, Ph.D., 1973, University of Washington
Professor Timothy J. Tyrrell, Ph.D., 1978, Cornell University
Associate Professor Stephen K. Swallow, Ph.D., 1988, Duke University
Associate Professor Dennis G. Wichelns, Ph.D., 1986, University of California, Davis
Assistant Professor Cathy Wessells, Ph.D., 1989, University of California, Davis

Specializations

Environmental economics, commercial fisheries management, international fisheries development, fisheries marketing and trade, fisheries business economics, coastal zone land use and management, quality of the marine environment, aquaculture economics, offshore oil and gas management, and natural resource pricing policies.

Master of Science

Admission requirements: GRE; a strong undergraduate record in economics or business is highly desirable.

Program requirements: thesis option—24 credits including REN 534, a written comprehensive examination, and thesis. Nonthesis option—34 credits including REN 534, a written comprehensive examination, and REN 598, with a substantial paper requiring significant independent research.

Economics—Marine Resources (Interdepartmental)

Ph.D.

401-792-2471

This interdepartmental program offers study in the economics of marine resources. It is administered by the Department of Resource Economics, with advice by graduate advisory faculty from several disciplines.

Graduate Faculty

Resource Economics: Professor Weaver, *chairperson.* Professors J. Anderson, Gates, Grigalunas, Opaluch, Sutinen, and Tyrrell; Associate Professors Swallow and Wichelns; Assistant Professor Wessells.

Economics: Professors Burkett and Ramsay; Associate Professors Mead, C. Miller, Lardaro, and Suzawa.

College of Business Administration: Professors Comerford, Della Bitta, N. Dholakia, Jarrett, and Mojena; Associate Professors Dash and Lord.

Specializations (Ph.D.)

Environmental economics, commercial fisheries management and marketing, international fisheries development, coastal zone land use and management, quality of the marine environment, aquacultural economics, offshore oil and gas management, and natural resource pricing.

Admission requirements: GRE, 6 credits in statistics, and the following courses or their equivalents—ECN 327, 328, and 375.

Program requirements: the Ph.D. qualifying examination is required of students admitted without the master's degree. ECN 527, 576, 628; REN 534, 602, 630, 634, 635, and 676. Additional courses may be elected from appropriate offerings in economics, resource economics, engineering, geography, oceanography, mathematics, political science, statistics, computer science, and management science. The dissertation will be written on a problem involving marine resources or an associated industry, such as minerals, petroleum, fisheries, water, transportation, recreation, or waste disposal.

REN Courses
Resource Economics

410 Economics of Natural Resource Use *(II, 3)*
432 Economics of Land and Water Resources *(II, 3)*
435 Aquacultural Economics *(I, 4)*
440 Benefit-Cost Analysis *(II, 3)*
456 Tourism Economics *(II, 3)*
460 Economics of Ocean Management *(I, 3)*
491, 492 Special Projects *(I and II, 1–3 each)*

514 Economics of Marine Resources *(I, 3)* Role of economics in development of marine resources. Particular attention to problems of multiple use of resources and to the conflicts between private and public goals. *(Lec. 3) Pre: enrollment in the M.M.A. program or permission of instructor. Not for graduate credit in resource economics.* Grigalunas

520 Production Economics *(I, 2)* Production in natural resource economics. The formulation and estimation of production functions. Technological change in economic growth and its measures. New directions in production theory and applications. *(Lec. 2) Pre: ECN 528 or permission of instructor.* Staff

522 Mathematical Programming for Natural Resource Management *(I, 2)* Application of mathematical (linear) programming to typical natural resource management issues. Emphasis is placed on problem formulation and solution using existing computer software programs. *(Lec. 2) Pre: 528 or permission of instructor.* Gates

524 Dynamic Economic Models *(I, 3)* Fundamentals of dynamic economic theory and nonlinear models. Dynamic and nonlinear optimization techniques applied to resource economics, decision analysis, and trade models. *(Lec. 3) Pre: 528 or permission of instructor. In alternate years. Next offered spring 1995.* Anderson

527 Macroeconomic Theory
See Economics 527.

528 (or ECN 528) Microeconomic Theory *(I, 3)* Analytic tools of optimization. Neoclassical price and distribution theory. Linear programming and production theory. General equilibrium and welfare economics. *(Lec. 3) Pre: ECN 328 and 375 or equivalent, or permission of instructor.* Staff

532 Land Resource Economics
See Community Planning 537.

534 Economics of Natural Resources *(II, 3)* Microeconomic theory applied to problems of natural resource allocation. The rationale for government intervention in the market's provision of natural resources and alternative techniques for optimally allocated natural resources are investigated. *(Lec. 3) Pre: 528 or permission of instructor.* Wichelns

540 Applied Resource Economics *(II, 3)* Examines issues in agricultural and natural resource policy through applications of theoretical and empirical tools. Applications include pollution control, fisheries management, water, and agricultural policy. *(Lec. 3) Pre: ECN 528 and ECN 376 or permission of instructor.* Opaluch

543 Economic Structure of the Fishing Industry *(I, 3)* Analysis of fishing industries from the standpoint of activity and efficiency. Problems related to common property resources, government policy, labor, and legal and institutional factors. *(Lec. 3) Pre: 514 or permission of instructor. In alternate years. Next offered fall 1994.* Staff

576 Econometrics
See Economics 576.

591, 592 Special Projects *(I and II, 1–3 each)* Advanced work under staff supervision arranged to suit the individual requirement of the student. *(Independent Study) Pre: permission of chairperson.* Sutinen

595 (or ECN 595, MAF 595, PSC 595, SOC 595) Problems of Modernization in Developing Nations *(II, 3)* Selected regional problems in the environmental complex, agricultural systems, population dynamics, distribution systems, political integration, urbanization-industrialization, popular participation, integrated theories of modernization. *(Lec. 3) Pre: permission of instructors.* Krausse (marine affairs), Weaver (resource economics), Poggie (sociology and anthropology), and Suzawa (economics)

598 Master's Nonthesis Research *(I and II, 1–3)* Credit for completion of major paper. *(Independent Study) Pre: enrollment in nonthesis master's program in resource economics.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

602 Research Methodology *(I, 3)* Evaluation of alternative research methods and techniques. Development of specific research projects. *(Lec. 2, Lab. 2) In alternate years. Next offered fall 1995.* Gates and Weaver

610 Advanced Studies *(I and II, 1–3)* Advanced topics in resource economics. Mathematical models in resource management. *(Independent Study) May be repeated with different topics.* Staff

628 (or ECN 628) Advanced Microeconomic Theory *(II, 3)* Neoclassical value and distribution theory. Theories of imperfect competition, general equilibrium theory, and dynamic analysis. *(Lec. 3) Pre: 527 and 528 or permission of instructor. In alternate years. Next offered fall 1994.* Staff

630 Resource Analysis *(I, 3)* Development and application of welfare theory to natural resource use. Welfare concepts such as consumer surplus, producer surplus, and marginal cost pricing in policy decisions for agriculture and natural resources. *(Lec. 3) Pre: 628 or permission of instructor. In alternate years. Next offered spring 1995.* Staff

634 Economics of Resource Development *(II, 3)* Concepts of economic efficiency applied to natural resources with emphasis on intertemporal allocation of nonrenewable and renewable resources. Application of welfare and institutional economics to resource management and development; analysis of optimum allocation among users. *(Lec. 3) Pre: 534. In alternate years. Next offered fall 1995.* Sutinen

635 Marine Resources Policy *(I, 3)* Analysis of public policy problems relating to the development and management of marine resources, including fisheries, minerals, petroleum, water, and recreation. *(Lec. 3) Pre: 534. In alternate years. Next offered spring 1996.* Grigalunas

676 (or ECN 676) Advanced Econometrics *(II, 4)* A course covering the tools necessary for professional research in resource economics. Reviews the general linear model, but emphasis is on simultaneous equation models. Assumes a knowledge of introductory econometrics, statistical theory, and matrix algebra. *(Lec. 4) Pre: 576 or its equivalent.* Staff.

677 Econometric Applications in Resource Economics *(II, 3)* Special topics in econometrics as applied to agriculture and natural resources. Topics include time series models. Bayesian analysis and dichotomous dependent variables. *(Lec. 3) Pre: 676. In alternate years. Next offered spring 1996.* Tyrrell

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

ECN Courses
Economics

402 Urban Economics *(I or II, 3)*
403 Corporate Crime and Government Regulation *(I, 3)*
404 Political Economy of Class, Race, and Gender *(I, 3)*
444 Applied Research in Economics *(II, 3)*

512 History of Economic Analysis *(I, 3)* Advanced work on formative developments in economic thought from classical political economy to modern welfare economics. Emphasis on relationships between doctrines and their institutional setting. *(Lec. 3) Pre: permission of instructor.* Ramstad

515, 516 Economic Research *(I and II, 1–3 each)* Independent research. *(Independent Study) S/U credit.* Staff

526 Economics of Labor Markets
See Labor and Industrial Relations 526.

527 Macroeconomic Theory *(II, 3)* Static and dynamic models of aggregate economic behavior developed and analyzed. *(Lec. 3) Pre: 327 and 375 or equivalent, or permission of instructor.* Mead

528 Microeconomic Theory
See Resource Economics 528.

534 Information Sources and Uses in Labor Relations and Labor Economics
See Labor and Industrial Relations 534.

538 International Economics *(I or II, 3)* Theory and evidence on international trade and finance. Includes determinants and welfare effects of foreign trade, international investment, migration, exchange rates, and the balance of payments. *(Lec. 3) Pre: 327 and 328 or permission of instructor.* Burkett

544 International Financial Economics *(II, 3)* History, theory, and politics of the international financial system. Topics include the foreign exchange market, international banking, macroeconomic stabilization under fixed and floating exchange rates, exchange rate reform, and the global debt crisis. *(Lec. 3) Pre: 327.* McIntyre

552 Monetary Theory and Policy *(II, 3)* Analysis of structure and functioning of monetary and banking systems; discussion of contemporary monetary theories; evaluation of monetary policies. *(Lec. 3) Pre: 334 or permission of instructor.* Barnett

566 Economic Planning and Public Policy in Developing Nations *(II, 3)* Resource and financial planning in public and private sectors of developing nations with emphasis on planning tools, allocation of domestic and foreign resources, and on national economic policies. *(Lec. 3) Pre: 327 and 363 or 464, or equivalent, or permission of instructor.* Sharif

575 Introduction to Mathematical Economics *(I, 3)* Application of basic quantitative methods to economic analysis. Dynamic and static economic models will be studied with emphasis on obtaining solutions. *(Lec. 3) Pre: 327, 328, and MTH 141 or permission of instructor.* Miller

576 (or STA 576) Econometrics *(I, 4)* Application of statistics and mathematics to economic analysis. Implication of assumption required by statistical methods for testing economic hypotheses. Current econometric methods examined and discussed. *(Lec. 3, Lab. 2) Pre: 575 or equivalent, STA 308 or equivalent, or permission of instructor.* Lardaro

590 Principles of Economics *(I and II, 3)* Survey of micro- and macroeconomic theory. *(Lec. 3) Pre: graduate standing in accounting, labor and industrial relations, or M.B.A. program.* Lardaro

595 Problems of Modernization in Developing Nations
See Resource Economics 595.

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

628 Advanced Microeconomic Theory
See Resource Economics 628.

676 Advanced Econometrics
see Resource Economics 676.

Spanish

M.A.
401-792-5911

Graduate Faculty

Chairperson: Professor John M. Grandin, Ph.D., 1970, University of Michigan
Director of Graduate Studies: Professor Robert Manteiga, Ph.D., 1977, University of Virginia
Professor David M. Gitlitz, Ph.D., 1968, Harvard University
Professor Michael Navascués, Ph.D., 1971, Rutgers–The State University
Associate Professor Thomas D. Morín, Ph.D., 1975, Columbia University
Associate Professor Mario Trubiano, Ph.D., 1979, University of Massachusetts
Associate Professor Clement White, Ph.D., 1987, Brown University

Specializations

The Master of Arts in Spanish is designed for those who wish to perfect their undergraduate achievement in the general area of Hispanic studies, including language mastery and understanding of literature in the total context of civilization and culture. The literary production of Spain, Spanish America, and the Spanish-speaking peoples of the United States will be studied. Any one of these areas could provide a field for specialization.

Master of Arts

Admission requirements: undergraduate major in Spanish or equivalent, including 12 credits in Spanish or Hispanic-American literature. Qualified students may be admitted with less than 12 credits but must make them up without graduate credit.

Program requirements: all work carried out in Spanish. Thesis option—30 credits including 6 thesis research credits. Nonthesis option—30 credits. All candidates must pass a written comprehensive examination and an oral comprehensive examination. Course work may be completed on campus or through the URI summer study program in Salamanca, Spain, or a combination of both.

SPA Courses
Spanish

401 Oral and Dramatic Presentation of Hispanic Literature *(I, 3)*
421 Business Spanish *(I or II, 3)*
430 Castilian Prose of the Sixteenth and Seventeenth Centuries *(II, 3)*
431 Drama and Poetry of the Sixteenth and Seventeenth Centuries *(II, 3)*
450 Romanticism and Realism *(II, 3)*
470 Topics in Hispanic Literature *(I and II, 3)*
481 Don Quixote *(I, 3)*
485 Modern Spanish Narrative *(II, 3)*
486 Modern Spanish Poetry and Drama *(II, 3)*
488 Spanish-American Poetry and Drama *(I or II, 3)*
489 The Spanish-American Narrative *(I or II, 3)*
497, 498 Directed Study *(I and II, 3 each)*

510 Contemporary Spanish Workshop *(SS, 3–6)* New developments in all areas of Hispanic studies including pedagogical matters and classroom techniques. *(Workshop) Pre: graduate standing or permission of instructor.* Staff

561 Seminar in Medieval Poetry and Prose *(I, 3)* Examination and analysis of the epic, lyrical, and narrative medieval literature of Spain and its impact on subsequent literature. *(Seminar) Pre: graduate standing or permission of instructor.* Trubiano or Navascués

570 Topics in Hispanic Literature and Culture *(I, II, or SS, 3)* Special topics or authors not emphasized in other courses. *(Seminar) Pre: graduate standing or permission of instructor.* Trubiano or Staff

572 Evolution of Spanish-American Culture and Thought *(II, 3)* Development of Spanish-American thought and cultural trends, as portrayed in major works of artists and thinkers. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years. Next offered spring 1996.* Morín or White

574 Interpretations of Modern Spanish-American Thought *(I or II, 3)* Topics of interest in the development of modern Spanish-American thought as represented in the essay from the period of independence to the present. *(Seminar) Pre: graduate standing or permission of instructor.* Morín or White

580 Seminar in Nineteenth-Century Spanish Literature *(I or II, 3)* Selected authors and topics from the Spanish Romantic movement through realism and naturalism. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated with different topic and permission of instructor.* Navascués or Trubiano

584 Interpretations of Modern Spain *(I, 3)* Development of Spanish thought particularly with respect to sociological and cultural problems from the eighteenth century to the contemporary period as seen through the writings of significant essayists. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years. Next offered spring 1996.* Manteiga or Navascués

585 Seminar in Twentieth-Century Spanish Literature *(I, 3)* Topics of aesthetic, cultural, and linguistic concern in twentieth-century peninsular literature. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated with different topic and permission of instructor.* Manteiga

587 Seminar in Renaissance and Baroque Literature *(II, 3)* Aesthetic analysis of works representative of the period and their influence on subsequent literatures. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated with different topic and permission of instructor.* Trubiano

588 Seminar in Colonial Spanish-American Literature and Culture *(I or II, 3)* Topics of interest dealing with the development of Spanish-American cultural identity and literature from the period of discovery and colonization to independence. *(Seminar) Pre: graduate standing or permission of instructor.* Morín or White

589 Seminar in Modern Spanish-American Literature and Culture *(I or II, 3)* Topics of interest dealing with the development of Spanish-American literature and culture from the period of independence to the present. *(Seminar) Pre: graduate standing or permission of instructor. May be repeated with a different topic.* Morín or White

590 The Hispanic Presence in the United States *(II, 3)* A study of the establishment of the Hispanic presence and its heritage in the art, folklore, and language of the United States, and an analysis of the literature of the Spanish-speaking peoples. *(Lec. 3) Pre: graduate standing or permission of instructor. In alternate years. Next offered fall 1994.* Staff

597, 598 Directed Study *(I and II, 3 each)* Individual research and reports on problems of special interest. *(Independent Study) Pre: graduate standing and approval of the director of graduate studies. May be repeated with different topic.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Speech-Language Pathology and Audiology

M.A., M.S.
401-792-5969

Graduate Faculty

Chairperson: Associate Professor Jay Singer, Ph.D., 1976, Case Western Reserve University
Professor Walter J. Beaupre, Ph.D., 1962, Columbia University
Professor Barbara Culatta, Ph.D., 1975, University of Pittsburgh
Professor Stephen D. Grubman-Black, Ph.D., 1972, State University of New York, Buffalo
Associate Professor John P. Preece, Ph.D., 1985, University of Iowa
Assistant Professor Ovetta L. Harris, Ph.D., 1992, University of Massachusetts

Specializations

Audiology and speech-language pathology.

Master of Arts and Master of Science

Admission requirements: 19 undergraduate credits in communicative disorders (always including CMD 372, 373, 374, 375, 376, and

465, or equivalents). Although cumulative average is not the sole criterion for admission to the graduate programs in speech-language pathology and audiology, those applicants with overall quality point averages of less than 3.00 (on a 4.00 scale) may be advised to address background deficits to gain admission to the program. The completed application package must be received by October 15 for spring admission and March 1 for fall admission.

Program requirements: for M.A. in speech-language pathology (46 credits), thesis; CMD 504; 26 credits in speech pathology and seven credits in audiology. For M.A. in audiology (46 credits), thesis; CMD 504; 26 credits in audiology and seven credits in speech pathology. For M.S. in speech-language pathology (46 credits), no thesis; written comprehensive examination; CMD 504; 32 credits in speech pathology and seven credits in audiology. For M.S. in audiology (46 credits), no thesis; written comprehensive examination; CMD 504; 32 credits in audiology and 7 credits in speech pathology. For either the M.A. or M.S. program in speech-language pathology or audiology, students must complete 25 hours of directed observations and a minimum of 350 supervised clock hours of practicum in addition to the academic requirements. Because program requirements in both speech-language pathology and audiology include clinical responsibilities, the average length of time to complete any of the programs is two academic years.

Accelerated bachelor's/master's option for speech-language pathology or audiology students: University of Rhode Island senior undergraduate majors in communicative disorders who have met requirements for early acceptance in the graduate program of either audiology or speech-language pathology may follow a special sequence of graduate-level course work and clinical practicum during their senior year. If eligible, following the award of the Bachelor of Science degree in communicative disorders, students may complete a 30-semester-hour master's degree (rather than the usual 46-semester-hour master's degree) in one year of full-time graduate study. This option, which requires careful sequencing of senior and graduate course work, is not available to students from other undergraduate institutions nor to students who elect part-time graduate study prior to completion of the fifth year.

Admission requirements: URI sixth-semester standing in communicative disorders with all major requirements completed and 25 elective credits remaining; a 3.00 cumulative quality point average and 3.20 in the major through the fifth semester; and two letters of recommendation from URI communicative disorders faculty.

Program requirements: for students who have taken the specified 25 credits (16 of which must be at the 500 level) of communicative disorders course work in the senior year to complete the bachelor's degree in communicative disorders, 30 credits of course work in the fifth year (postbaccalaureate) at the 500 level. Specific course requirements are as stated in the regular two-year master's program.

CMD Courses
Communicative Disorders

475 Gestural Communication *(II, 3)*
491, 492 Special Problems
(I and II, 1–3 each)

504 Speech and Hearing Research *(II, 3)* Types of research in speech pathology, audiology, and communication science; critiques of representative models with special emphasis on experimental research; individual pilot projects or master's thesis. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Staff

551 Measurement of Hearing *(I, 3)* Diagnostic protocols and practicum for routine audiological assessment; etiology and symptomatology of hearing disorders; overview of aural rehabilitation including hearing aids. *(Lec. 2, Lab. 1) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Singer

552 Advanced Measurement of Hearing *(II, 3)* Advanced audiometrics; speech audiometry; immittance measures, cochlear measures; retrocochlear measures; pseudohypacusis measures, and central auditory measures. *(Lec. 2, Lab. 2) Pre: 551 or permission of instructor.* Staff

553 Pediatric Audiology *(I, 3)* Theoretical and methodological approaches to the identification and management of children with auditory disorders. Topics discussed include auditory development, audiometric evaluation, and hearing aids. *(Lec. 3) Pre: 551 or permission of instructor.* Staff

554 Rehabilitative Audiology *(I, 3)* Theoretical and methodological approaches to aural rehabilitation of the hearing-impaired adult. Topics discussed include use of amplification, speech reading, auditory training, and case management. *(Lec. 3) Pre: 551 or permission of instructor.* Staff

555 Amplification for the Hearing Impaired *(II, 3)* Electroacoustics and psychoacoustics of wearable hearing aids; selection and fitting procedures, counseling; classroom amplification systems. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor. In alternate years.* Singer

556 Electrophysiological Measures in Audiology *(II, 3)* Basic electrophysiologic procedures, instrumentation, electrocochleography, auditory brain stem responses, and middle, late, and long-latency auditory evoked potentials. *(Lec. 2, Lab. 2) Pre: 551, 552, or permission of instructor.* Staff

560 Disorders of Phonation *(II, 3)* Etiology and symptomatology of vocal pathology; intervention strategies for organic and functional voice disorders; emphasis on rehabilitation team approach to voice-resonance problems associated with cleft palate. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Beaupre

561 Articulation Disorders *(I, 3)* Assessment, design, and implementation of therapeutic management programs for various speech production disorders at the articulatory and phonological levels. *(Lec. 3) Pre: 372, 373, 374, 375, or equivalent, or permission of instructor.* Staff

564 Language Disorders in School-Aged Children *(II, 3)* Study of communication deficits in learning-disabled school-aged children; differential diagnoses; assessment of cognitive functioning; language processing and discourse; therapeutic strategies for training abstract and functional language. *(Sem. 3) Pre: graduate standing or permission of instructor.* Culatta

567 Clinical Practicum in Speech Pathology *(I and II, 1–3)* Supervised diagnostic and therapeutic procedures with persons experiencing communicative disorders. Differential diagnosis, parent counseling, and cooperation with allied personnel. Practicum held on campus and within institutional and school settings. *(Practicum) Pre: graduate standing.* Staff

568 Clinical Practicum in Audiology *(I and II, 1–3)* Supervised clinical practicum concerned with audiological assessment of hearing disorders and auditory rehabilitation with the hearing impaired. Practicum held on campus and within institutional and school setting. *(Practicum) Pre: 551 and graduate standing.* Staff

569 Diagnostic Procedures *(I, 3)* Major procedures for assessment and evaluation in speech-language pathology. Implications of diagnostic data for referrals, prognosis, therapeutic programs, and consultations. *(Lec. 3) Pre: 372, 373, 374, 375, or equivalent, or permission of instructor.* Staff

570 Clinical Practicum in Communicative Disorders *(I and II, 1–5)* Supervised assessment and rehabilitation procedures with persons experiencing communicative disorders in speech-language pathology and/or audiology. Practicum sites scheduled on campus and within hospital, school, institutional, and private settings. *(Practicum) Pre: graduate standing, 25 observation hours, and appropriate course work.* Staff

572 Medical Audiology *(I, 3)* Diagnostic implications of audiometry for various organic disorders; supportive audiological information relevant to medical and surgical interventions; differential data associated with otosclerosis, Meniere's disease, VIIIth cranial nerve tumors, and malingering. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Staff

573 Contemporary Problems in Audiology *(II, 3)* Critical review of current research and controversial issues within the profession; student selects one topic for independent

study. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Staff

574 Environmental Audiology *(II, 3)* Hearing problems in industry, in the military, and other high-noise-level environments; medico-legal aspects of hearing loss; hearing conservation programs in public schools. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Singer

577 Speech and Language for the Hearing Impaired *(II, 3)* Assessment, development and/or maintenance of voice, speech, and language skills associated with congenital or adventitious deafness; seminar approach to strategies in current practice with children and adults. *(Sem. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Beaupre

580 Augmentative Communication *(II, 3)* Assessment, selection, and implementation of augmentative communication devices and systems for severely communicatively impaired persons emphasizing the transdisciplinary approach, fabrication, and experience with current electronic equipment. *(Lec. 3) Pre: course work in aphasia, cerebral palsy, or head trauma, and permission of instructor.* Lytton or Carlson

581 Cerebral Palsy *(I, 3)* Identification of type of cerebral palsy by location of lesion, motor symptomatology, and additional handicaps; role of the speech clinician on the team; types of speech therapy with emphasis on the Bobath approach; current research and controversial issues. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Staff

582 Motor Speech Disorders *(II, 3)* Diagnosis and management of apraxia of speech and dysarthrias. Aspects of neuro-anatomy relevant to the production of speech. Etiologies of motor speech disorders including neuromotor diseases, stroke, and trauma. *(Lec. 3) Pre: admission to graduate program and 372 or equivalent. In alternate years. Next offered spring 1995.* Staff

584 Language Disorders in Developmentally Young Children *(I, 3)* Study of communication deficits in developmentally young and multihandicapped children; types of language problems; differential diagnoses; assessment of conceptual requisites and concrete language skills; interactive therapeutic strategies. *(Lec. 3) Pre: graduate standing or permission of instructor.* Culatta

585 Aphasia and Allied Language Disorders *(II, 3)* Types of adult aphasia; central and peripheral dysarthrias; role of speech clinician on the rehabilitation team; other degenerative disorders such as Parkinsonism and dystonia; current research and controversial issues. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Staff

586 Alaryngeal Speech *(I, 3)* Voice and speech rehabilitation for individuals without a functional larynx; social, emotional, and medical considerations; clinical procedures for esophageal, pharyngeal, and buccal speech; implications for use of artificial larynx; current research. *(Lec. 3) Pre: 372, 373, 374, 375, graduate standing, or permission of instructor.* Beaupre

591 Contemporary Issues in Speech and Language Pathology *(II, 3)* Critical review of selected current research and controversial issues in the profession. Topics will vary each offering. *(Sem. 3) Pre: minimum of 15 graduate credits in speech-language pathology, including 504, or permission of instructor. May be repeated for a maximum of 6 credits.* Beaupre and Culatta

592 Stuttering and Cluttering *(I, 3)* Study of nature and causes of stuttering; analyses of current theories and research concerning stuttering and cluttering; development of a rationale for diagnosis, case selection, and intervention. *(Lec. 3) Pre: graduate standing and/or permission of instructor.* Staff

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Statistics

M.S.
401-792-2701

Graduate Faculty

Chairperson: Professor Edmund A. Lamagna, Ph.D., 1975, Brown University
Section Head: Professor R. Choudary Hanumara, Ph.D., 1968, Florida State University
Professor Edward J. Carney, Ph.D., 1967, Iowa State University
Professor James F. Heltshe, Ph.D., 1973, Kansas State University
Associate Professor William D. Lawing, Ph.D., 1965, Iowa State University
Assistant Professor Colleen Kelly, Ph.D., 1991, University of California, San Diego

Specializations

Experimental design, sampling, ecological statistics and biostatistics, statistical computation, simulation, multivariate analysis, nonparametric methods, classification and discrimination, analysis of variance, bootstrap and jackknife estimation, sequential methods.

Master of Science

Admission requirements: bachelor's degree including the equivalent of MTH 141, 142 Introductory and Intermediate Calculus with Analytic Geometry; MTH 243 Calculus for Functions of Several Variables; MTH 215 Introduction to Linear Algebra; CSC 201 Introduction to Computing; STA 409 Statistical Methods in Research I. GRE (advanced test in mathematics or undergraduate field is desirable).

Thesis option program requirements: a minimum of 24 credits (exclusive of thesis) including MTH 451, STA 412, either STA 501 or 502, and at least nine additional credits selected from STA 500, 501, 502, 520, 541, 542, 550, 592, 611.

Nonthesis option program requirements: 33 credits distributed as follows:

1) MTH 451, STA 412, and either STA 501 or 502.

2) At least nine credits selected from STA 500, 501, 502, 520, 541, 550, 592, 611.

3) At least six of the remaining credits must be at the 500 level or above (exclusive of STA 591).

4) The above course work must include at least one course that requires a substantial paper involving significant independent study.

5) Written comprehensive examination.

Doctor of Philosophy

See Applied Mathematical Sciences on page 30.

General Information

Programs of study can be designed for individuals who are employed on a full-time basis.

STA Courses
Statistics

409 (EST) Statistical Methods in Research I *(I and II, 3)*
411 (or PHP 411) Biostatistics II *(II, 3)*
412 (EST) Statistical Methods in Research II *(I and II, 3)*
413 (EST) Data Analysis *(I, 3)*
491 (EST) Directed Study in Statistics *(I and II, 1–3)*
492 (EST) Special Topics in Statistics *(I or II, 3)*

500 (EST) Nonparametric Statistical Methods *(I or II, 3)* Rank and sign tests, permutation tests and randomization, run test, tests of goodness of fit, order statistics, estimation, and comparison with parametric procedures. Examples illustrating the applications of nonparametric techniques. *(Lec. 3) Pre: 409.* Staff

501 (EST) Analysis of Variance and Variance Components *(I or II, 3)* Analysis of variance and covariance, experimental design models, factorial experiments, random and mixed models, estimation of variance components, unbalanced data. *(Lec. 3) Pre: 412.* Staff

502 (EST) Applied Regression Analysis *(I or II, 3)* Topics in regression analysis including subset selection, biased estimation, ridge regression, and nonlinear estimation. *(Lec. 3) Pre: 412.* Staff

517 Small N Designs
See Psychology 517.

520 (EST) Fundamentals of Sampling and Applications *(I or II, 3)* Simple random sampling; properties of estimates, confidence

limits. Sample size. Stratified random sampling; optimum allocation, effects of errors, and quota sampling. Regression and ratio estimates; systematic and multistage sampling. *(Lec. 3) Pre: 308 or 409.* Staff

532 (EST) (or ASP 532 or PSY 532) Experimental Design *(I, 3)* Application of statistical methods to biological and psychological research and experimentation. Experimental situations for which various ANOVA and ANCOVA designs are most suitable. *(Lec. 3) Pre: 409 or equivalent.* Staff

541 (EST) Multivariate Statistical Methods *(I or II, 3)* Review of matrix analysis. Multivariate normal distribution. Tests of hypotheses on means, Hotelling's T^2, discriminate functions. Multivariate regression analysis. Canonical correlations. Principal components. Factor analysis. *(Lec. 3) Pre: 412.* Staff

542 (EST) Discrete Multivariate Methods *(I or II, 3)* Analysis of multidimensional categorical data by use of log-linear and logit models. Discussion of methods to estimate and select models followed by examples from several areas. *(Lec. 3) Pre: 412.* Staff

550 (EST) Ecological Statistics *(I, 3)* Application of statistical methodology to the following topics: population growth, interactions of populations, sampling and modeling of ecological populations, spatial patterns, species abundance relations, and ecological diversity and measurement. *(Lec. 3) Pre: 409 or permission of instructor.* Staff

576 Econometrics
See Resource Economics 576.

584 Pattern Recognition
See Electrical Engineering 584.

591 (EST) Directed Study in Statistics *(I and II, 1–3)* Advanced work in experimental statistics conducted as supervised individual projects. *(Independent Study) Pre: permission of chairperson. S/U credit.* Staff

592 (EST) Special Topics in Statistics *(I or II, 3)* Advanced topics of current interest in experimental statistics. *(Lec. 3) Pre: permission of chairperson.* Staff

599 (EST) Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

610 Parsimony Methods
See Psychology 610.

611 (EST) Linear Statistical Models *(I or II, 3)* Review of mathematical and statistical concepts. Multivariate normal distribution. Distribution of quadratic forms. Power of the F-test. Basic linear models: general linear hypothesis, regression models, experimental design models, variance component models, mixed models. *(Lec. 3) Pre: 501 or 502.* Staff

612 Structural Modeling
See Psychology 612.

635 Response Surfaces and Evolutionary Operations
See Industrial and Manufacturing Engineering 635.

Teacher Certification

401-792-5930

Students who did not obtain Rhode Island Teacher Certification as part of their undergraduate studies may do so by being admitted to a teacher certification program and satisfactorily completing a prescribed set of courses in the appropriate fields. Such applicants should indicate the specific TCP program code on the application forms and submit two official transcripts of all prior academic work, showing receipt of the bachelor's degree, plus a personal statement of objectives and two letters of recommendation.

Applications for the education program are reviewed each May; admission is competitive. If space becomes available for any particular TCP program, completed applications for that program may be reviewed subsequently. A test of basic skills is required prior to action on your application. The NTE Communications and General Knowledge tests are required as part of the admissions process for the resource development (agriculture), physical education, and music education programs. For all other teacher education programs, the basic skills requirement consists of mathematics and writing tests administered by the Department of Education each spring. Please contact the appropriate department(s) listed below for additional information relative to this requirement. An interview is also required of all applicants. Students admitted to the TCP program are governed by the same academic standards as matriculated graduate students.

Further information can be obtained from the Office of Teacher Education at 401-792-5930 or from the following areas of specialization:

Early Childhood Education (510): Associate Professor David Caruso, Chairperson, Department of Human Development and Family Studies, 401-792-2150

Elementary Education (513): Assistant Professor Betty Young, Department of Education, 401-792-4150

Secondary Education (513)
English: Associate Professor Richard Nelson, Department of Education, 401-792-4165
Mathematics: Professor John Long, Department of Education, 401-792-4149
Science: Professor William Croasdale, Department of Education, 401-792-4161
Social Studies: Professor Robert MacMillan, Department of Education, 401-792-4155
Languages: Professor Joann Hammadou, Department of Languages, 401-792-4712

Music Education (070): Assistant Professor Carolyn Livingston, Department of Music, 401-792-2431

Resource Development (Agriculture): Associate Professor Anthony Mallilo, Department of Resource Development Education, 401-792-2981

School Library Media (940): Assistant Professor Cheryl McCarthy, Graduate School of Library and Information Studies, 401-792-2878

Textiles, Fashion Merchandising, and Design

M.S.
401-792-4574

Graduate Faculty

Chairperson: Professor Linda M. Welters, Ph.D., 1981, University of Minnesota
Professor Joy Emery, M.A., 1966, Ohio State University
Associate Professor Martin J. Bide, Ph.D., 1979, University of Bradford, United Kingdom
Associate Professor Misako Higa, Ph.D., 1973, University of Minnesota
Associate Professor Patricia A. Helms, Ph.D., 1971, Florida State University
Associate Professor Margaret Ordoñez, Ph.D., 1978, Florida State University
Assistant Professor Yvette Harps-Logan, Ph.D., 1990, Virginia Polytechnic Institute and State University
Adjunct Professor Laurence F. Gross, Ph.D., 1976, Brown University
Adjunct Professor Paul Hudon, Ph.D., 1971, Georgetown University
Adjunct Professor Alexander J. Patton, Ph.D., 1972, University of Rhode Island

The department offers a wide variety of individualized programs in close association with other departments (Art, Chemistry, Education, History, Human Development and Family Studies, Marketing) and with various social science fields.

Master of Science

Specializations: textile science, historic textiles and costume, textile conservation, and fashion merchandising.

Admission requirements: GRE and a bachelor's degree with adequate preparation for the proposed area of study.

Program requirements: thesis option—completion of a minimum of 30 credits, including six credits of thesis research. Non-thesis option—completion of a minimum of 33 credits, half of which must be TMD courses numbered 500 or above, including at least one course that requires a substantial paper involving significant independent study, and written comprehensive exams. TMD 510 is a requirement for all students.

For the textile science specialization—TMD 503 and 510; half of the remaining elective credits must be from TMD courses numbered 500 or above. For the historic textiles and costume specialization—TMD 510, 520, 524, and a supervised internship (TMD 530, 2–4 credits); half of the remaining elective credits must be from TMD courses numbered 500 or above. A minimum of nine credits is required to achieve a competency level in an allied field such as art history, history, or anthropology; this may result in a program of more than 30 credits. The committee may elect to waive this requirement if the candidate has adequate preparation in the allied field as an undergraduate. Candidates lacking undergraduate courses in textile science and historic costume may be required to make up deficiencies without graduate credit. For the fashion merchandising specialization—TMD 510 and 524; six credits to be selected from TMD 532, 542, and 552; half of the remaining elective credits must be from TMD courses numbered 500 or above. Candidates lacking undergraduate courses in textile science and fashion merchandising may be required to make up deficiencies without graduate credit.

TMD Courses
Textiles, Fashion Merchandising, and Design

402 Seminar in Textiles and Clothing *(II, 1–2)*
403 Textile Performance *(I, 3)*
406 Historic Furniture *(I, 3)*
413 Dyeing and Finishing of Textiles *(II, 3)*
416 Interior Design II *(I, 3)*
424 Fashion Theory and Analysis *(I or II, 3)*
432 Fashion Merchandising Operations Control *(II, 3)*
433 Textile Markets *(I and II, 3)*
440 Historic Textiles *(II, 3)*
453 Textiles: A Global Perspective *(I, 3)*
496 Interior Furnishings and Design Internship *(II, 3)*

500 Ethnic Costume and Textiles *(I, 3)* Survey of regional styles of costume and textiles from all areas of the world, excluding fashionable dress. Influence of social, economic, technological, and aesthetic factors. *(Lec. 3) Pre: 224 or equivalent, 340, 440, or permission of instructor. In alternate years.* Welters

503 Topics in Textile Science *(I, II, or SS, 3)* Advanced study in a particular area of textile science. One topic will be studied from a list that includes dyeing, finishing, printing, polymer and fiber chemistry, dyestuff chemistry, and color science. *(Lec. 2, Lab. 2) Pre: graduate standing, 303 or equivalent, or permission of instructor. May be repeated up to three times with different topics. Spring 1995: Environmental Issues in the Textile Industry.* Bide

510 Research Methods in Textiles *(I, 3)* Application of research methodology to the study of textiles and clothing. Approach is multidisciplinary in that experimental, social science, and historic methods are covered. *(Lec. 3) Pre: graduate standing or permission of instructor. Next offered fall 1995.* Welters

513 Detergency *(I, 3)* Study of chemical and mechanical interactions of textile fibers, fabrics, laundering products, equipment, and soils. Laboratory experience in evaluation of laundry products and fabric durability during laundering. *(Lec. 2, Lab. 2) Pre: graduate standing, 303 or equivalent, and permission of instructor. In alternate years.* Ordoñez

520 Introduction to Textile Conservation *(II, 3)* Survey of methods used to clean, repair, store, and display historic textiles and costumes. Laboratory experience in conservation practices. *(Lec. 2, Lab. 2) Pre: a textile science course and historic textiles or costume course, or permission of instructor.* Ordoñez

521 Topics in Textile Conservation *(I, 1–3)* Investigation of textile conservation theory and methodology. Some topics will include laboratory assignments. *(Lec. 1–3) Pre: 520 or experience in textile conservation, and permission of instructor. May be repeated with different topic. Fall 1994: Storage of Textiles and Costume Collections.* Ordoñez

522 Special Problems in Textile Conservation *(I, 1–3)* Supervised independent studies on specific textile conservation projects or research. *(Independent Study) Pre: 520 or experience in textile conservation, and permission of instructor. May be repeated for a maximum of 6 credits.* Ordoñez

524 Social and Psychological Aspects of Textiles and Clothing *(I, 3)* Seminar in social and psychological aspects of textiles and clothing. Theories and assumptions concerning relevance of clothing to individuals and groups. *(Lec. 3) Pre: 224 or permission of instructor.* Staff

530 Historic Textile Internship *(I and II, 2–4)* Supervised internship designed to introduce the student to management of textile and costume collections in a museum or historical society setting. Individually designed to suit student needs—conservation, education, and research. *(Practicum) Pre: 510, 520, graduate standing in textiles, fashion merchandising, and design, or permission of chairperson.* Welters or Ordoñez

532 Consumer Behavior in Fashion Retailing *(I or II, 3)* Use by fashion retailing management of explanatory and predictive models of consumer behavior relating to fashion merchandising in establishing retail policy and strategy. *(Lec. 3) Pre: graduate standing or permission of instructor.* Harps-Logan

540 Special Problems in Textiles and Clothing *(I and II, 3)* Supervised independent study in specific areas of textiles and clothing. *(Independent Study) Pre: permission of chairperson.* Staff

542 Fashion Promotion *(I or II, 3)* Emphasis on understanding and applying the principles of fashion retailing communication. Evaluation and application of effective promotional activities such as visual merchandising and fashion shows to trade and retail levels of fashion merchandising. *(Lec. 3) Pre: graduate standing or permission of instructor.* Harps-Logan

552 Retail Price Strategy *(I or II, 3)* Economic, financial, legal, and fashion retailing principles are examined and integrated into a functional model in order to analyze management's pricing decisions and strategies for fashion merchandise. *(Lec. 3) Pre: graduate standing or permission of instructor.* Harps-Logan

570 Topics in Historic Textiles or Costume *(I, II, or SS, 3)* Advanced study in a particular area of historic textiles or costume using artifactual and documentary primary sources. Use of historic textile and costume collection. *(Lec. 3) Pre: 340, 440 or equivalent. May be repeated for a maximum of 6 credits.* Ordoñez or Welters

596 Interior Furnishing and Design Seminar *(II, 3)* Historic and modern furnishings; interior space, structures, and design as they relate to furniture, equipment, fixtures, accessories, interior materials, and fabrics. *(Seminar) Pre: 406 or equivalent or permission of instructor. In alternate years.* Higa

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

Zoology

M.S., Ph.D. (Biological Sciences)
401-792-2372

Graduate Faculty

Acting Chairperson: Professor Robert C. Bullock, Ph.D., 1972, Harvard University
Professor J. Stanley Cobb, Ph.D., 1969, University of Rhode Island
Professor Robert F. Costantino, Ph.D., 1967, Purdue University
Professor Frank H. Heppner, Ph.D., 1967, University of California, Davis
Professor Robert B. Hill, Ph.D., 1957, Harvard University
Professor Kerwin E. Hyland, Jr., Ph.D., 1953, Duke University
Professor Gabriele Kass-Simon, D.Phil., 1967, University of Zurich
Professor Steffen H. Rogers, Ph.D., 1968, Vanderbilt University
Professor C. Robert Shoop, Ph.D., 1963, Tulane University
Professor Jennifer L. Specker, Ph.D., 1980, Oregon State University
Professor Howard E. Winn, Ph.D., 1955, University of Michigan
Associate Professor Harold D. Bibb, Ph.D., 1969, University of Iowa

Associate Professor Marian R. Goldsmith, Ph.D., 1970, University of Pennsylvania
Associate Professor William H. Krueger, Ph.D., 1967, Boston University
Associate Professor John P. Mottinger, Ph.D., 1968, Indiana University
Associate Professor Saran Twombly, Ph.D., 1983, Yale University
Assistant Research Professor David A. Bengtson, Ph.D., 1972, University of Rhode Island
Adjunct Professor Donald C. Miller, Ph.D., 1965, Duke University
Adjunct Professor Ruth D. Turner, Ph.D., 1954, Radcliffe College, Harvard University
Adjunct Assistant Professor Clifford H. Katz, Ph.D., 1982, University of Connecticut
Adjunct Assistant Professor Thomas N. Mather, Ph.D., 1983, University of Wisconsin

Specializations

Acarology, animal behavior, animal diversity, cell and tissue biology, developmental biology, ecology, endocrinology, genetics (ecological, molecular, population), herpetology, ichthyology, limnology, mammalogy, marine biology, neurobiology, ornithology, parasitology, physiology, radioecology, reproductive biology, systematics, and taxonomy.

Master of Science

Admission requirements: GRE and bachelor's degree with major in zoology, biology, or allied field. Applicants are normally admitted for September only. The completed application package should be received by April 15. For consideration for financial aid, the application package should be received by February 1.

Program requirements: thesis.

Doctor of Philosophy (Biological Sciences)

Admission requirements: master's degree is not required. GRE with advanced test (biology) and bachelor's degree with major in zoology, biology, or allied field. Applicants are expected, but not required, to have a reading knowledge of two languages in addition to their native language. Applicants are normally admitted for September only. The completed application package should be received by April 15. For consideration for financial aid, the application package should be received by February 1.

Program requirements: dissertation, qualifying examination required for all candidates except holders of M.S. degree. Although there is no departmental language requirement, the candidate's committee may require demonstration of proficiency in one or two languages other than the candidate's native language. Comprehensive examination.

ZOO Courses
Zoology

437 (or BCH 437 or BOT 437) Fundamentals of Molecular Biology *(I, 3)*
441 Environmental Physiology of Animals *(I, 3)*
442 Mammalian Physiology *(II, 3)*
444 Experimental Physiology *(II, 3)*
445 Endocrinology I *(I, 3)*
454 Invertebrate Zoology *(II, 4)*
455 (or BOT 455) Marine Ecology *(I, 3)*
457 (or BOT 457) Marine Ecology Laboratory *(I, 1)*
460 Advanced Population Biology *(II, 3)*
465 Limnology *(I, 4)*
466 Vertebrate Biology *(II, 3)*
467 Animal Behavior *(II, 3)*

501 Systematic Zoology *(I, 3)* Species concepts and theories of biological classification. Taxonomic decisions and publication, numerical taxonomy, and review of the rules of zoological nomenclature. *(Lec. 3) Pre: ZOO 262 and BOT 352, 254 or 466 recommended. In alternate years. Next offered 1994.* Bullock

505 Biological Photography *(I, 2)* Application of scientific photography to biological subjects, living and prepared. Photomacrography and photomicrography. Principles of photography as applied to the specialized needs of biological research and publication. *(Lab. 6) Pre: permission of instructor.* Heppner

508 Seminar in Zoological Literature *(II, 1)* Survey of zoological literature including traditional methods of bibliographic control, contemporary information retrieval services, and the development of a personalized information system. *(Lec. 1) Pre: graduate standing in zoology.* Kelland

521 Recent Advances in Cell Biology See Microbiology 521.

531 Advanced Parasitology Seminar *(II, 2)* Advanced topics in the host-parasite relationships of protozoan and metazoan parasites. Reading knowledge of one foreign language assumed. Topics vary from year to year. *(Lec. 2) Pre: 331 or equivalent.* Hyland

541 Comparative Physiology of Marine Animals *(I, 3)* Comparison of physiological mechanisms by which animals maintain life with emphasis on marine invertebrates. Responses to external environment mediated by receptors, nervous systems, effectors. Living control systems for muscular activity and circulation. *(Lec. 2, Lab. 3) Pre: 101 and 201. In alternate years. Next offered 1994–95.* Hill

545 Endocrinology II *(I, 3)* Molecular basis of hormone action and evolution of regulatory systems. *(Lec. 3) Pre: BCH 311, ZOO 442, graduate standing, and permission of instructor. In alternate years. Next offered 1995–96.* Specker

546 Introduction to Neurobiology *(II, 2)* Fundamental processes in neurobiology with emphasis on cellular and membrane mechanisms of nerve functioning. *(Lec. 2) Pre: 201 and MTH 141. In alternate years. Next offered spring 1996.* Kass-Simon

547 Laboratory in Electrophysiological Techniques *(II, 2)* Introduction to methods of extracellular and intracellular electrophysiology of excitable tissues. *(Lab. 4) Pre: credit or concurrent enrollment in 546. In alternate years. Next offered spring 1996.* Kass-Simon

549, 550, 551 Advanced Topics in Neurobiology *(II, 3 each)* Published papers in selected aspects of neurobiology will be discussed. Representative topics include role of Ca++, c-AMP in the nervous system, gating currents learning at the cellular level, cellular rhythmicity. *(Seminar) In alternate years. Next offered 1995.* Kass-Simon

561 Behavioral Ecology *(I, 3)* The interaction of animal behavior, ecology, and evolution. Topics include predator-prey relationships, resource partitioning, competition, territoriality, and reproductive behavior. Term project required. *(Lec. 3) Pre: a course in animal behavior and a course in ecology. In alternate years. Next offered 1995–96.* Cobb

562 Seminar in Behavioral Ecology *(I, 1)* Special topics in the relationships between animal behavior and ecology, such as social organization of animals, evolution of behavior, competition, and habitat selection. Discussion and presentation of individual reports. *(Seminar) S/U only.* Cobb

563 Ichthyology *(I, 3)* Fishes of the world. Their structure, evolution, classification, ecology, and physiology. Emphasis on local marine and freshwater fauna. Several field trips. *(Lec. 2, Lab. 3) Pre: 102 or 202 and 466.* Staff

566 Herpetology *(II, 3)* Biology of recent orders of amphibians and reptiles; emphasis on adaptations and evolution, world faunal relationships past and present, current systematic problems. Selected herpetological material in laboratory, field trips. *(Lec. 2, Lab. 3) Pre: 102 or 202 or permission of instructor.* Shoop

567 Natural Selection *(II, 3)* Ideas and controversies concerning the action of natural selection. Maintenance of genetic variability, neutral mutation, levels of selection, recombination and sexual reproduction, and rates of evolution. *(Lec. 2, Lab. 3) Pre: 262 and BOT 352 or ZOO 104, or permission of instructor.* Twombly

568 Ornithology *(II, 2)* Biology of birds with emphasis on the role of birds in biological research. Areas covered include systematics, evolution, physiology, ecology, and behavior. Discussion of current topics in ornithology. *(Lec. 2) Pre: 466 or permission of instructor.* Heppner

570 Field Biology of Fishes *(II, 3)* Selected field problems in fish biology, including distribution and diversity, habitat segregation, reproduction, and natural movements. Emphasis on freshwater and diadromous populations. *(Lec. 3) Pre: 563 or permission of*

instructor. Limited to 10 students, with preference given to graduate students and senior zoology majors. In alternate years. Next offered 1994–95. Staff

573 (or BCH 573) Developmental Genetics *(I, 3)* An examination of animal and plant model systems incorporating concepts of cell biology, physiology, molecular biology, and genetics to understand fundamental mechanisms regulating patterns of organismal development. *(Lec. 3) Pre: introductory courses in genetics development, biochemistry, or molecular biology preferred.* Goldsmith, Bibb, and Chandlee

579 (or BCH 579 or BOT 579) Advanced Genetics Seminar *(I and II, 1)* Current topics in genetics, including cytological, ecological, molecular, physiological, population, quantitative, and radiation genetics. *(Seminar) Pre: BOT 352 and permission of instructor.* Goldsmith and Mottinger

581 General Acarology *(I, 3)* Detailed study of mites and ticks, their structure, life histories, and classification. Free–living forms as well as plant and animal feeders. *(Lab. 6) Pre: 331 or 586. In alternate years. Next offered 1995–96.* Hyland

586 Medical and Veterinary Entomology *(II, 3)* Life histories, classifications, habits, and control of insects and other arthropods which affect the health of man and animals. Duties of the entomologist on a public health team, including field practice in methods of insect surveys, control measures, and subsequent surveys to determine success of control measures. *(Lec. 1, Lab. 4) Pre: 331 or 381 or equivalent. In alternate years. Next offered 1994–95.* Hyland

587 Seminar in Neurobiology *(I or II, 1)* Current literature in the neurosciences will be surveyed. Topics include molecular and behavioral electrophysiology, ultrastructure of excitable cells, receptor and pharmacological neurobiology of invertebrates and vertebrates. *(Seminar) Pre: graduate standing or one advanced neuroscience course.* Kass-Simon

599 Master's Thesis Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

641, 642, 643, 644, 645 Seminar in Physiology *(I and II, 1–3 each)* Reports and discussions on topics of current research in physiology. Subject matter adapted to meet interests of staff and students. *(Seminar) Pre: permission of instructor.* Staff

664 Seminar in Ichthyology *(II, 2)* Reading, library research, reports, and class discussion on problems of current research interest in the biology of fishes. *(Seminar) Pre: 563 or permission of instructor. In alternate years. Next offered 1995–96.* Staff

666 Biology of Metamorphosis *(II, 3)* The evolutionary, ecological, and physiological regulation of metamorphosis and related life-history events in diverse taxa. *(Seminar) Pre: graduate standing and 541 or 545 or 567 or 573.* Specker or Twombly

668 Biology of Reproduction in Animals *(II, 3)* Evolution of sexual reproduction, neuroendocrine signals, and behavioral controlling mechanisms in diverse phyla. *(Lec. 3) Pre: 545, 561, or 567.* Twombly, Specker, and Cobb

675 Advanced Ecology Seminars *(I and II, 2 each)* Specialized and advanced areas of ecological research and theory, including zoogeography, Pleistocene ecology, population dynamics, energy flow in ecosystems, and radiation ecology. *(Seminar) Pre: permission of instructor.* Staff

679 Animal Communication
See Oceanography 679.

691, 692 Directed Research *(I and II, 1–3 each)* Subject matter adapted to meet needs of the student. May be arranged with any staff member. *(Independent Study) Pre: permission of chairperson.* Staff

693, 694 Zoological Problems *(I and II, 1–3 each)* Special work to meet needs of individual students who are prepared to undertake special problems. *(Independent Study) Pre: permission of chairperson. S/U credit for 694.* Staff

695 Graduate Seminar in Zoology *(I and II, 1)* Students to give seminar reports on their thesis research. Attendance and registration required of all graduate students in residence, but only 2 credits my be applied to the program of study. *(Seminar) Pre: graduate standing. S/U credit.* Staff

699 Doctoral Dissertation Research *(I and II)* Number of credits is determined each semester in consultation with the major professor or program committee. *(Independent Study) S/U credit.*

930 Workshop in Zoology Topics for Teachers *(I, II, or SS, 0–3)* Especially designed for secondary school science teachers. Basic topics in zoology from an advanced or pedagogical perspective. *(Workshop) Pre: teacher certification.* Staff

Other Courses

The following are courses grouped by additional subject areas, or courses that may be taken for graduate credit but are not part of a graduate program. Descriptions of the 400-level courses are found in the *Undergraduate Bulletin.* Where descriptions for 500-level courses are not provided, they can be found earlier in this bulletin.

AAF Courses
African and Afro-American Studies

410 (or PSC 410) Issues in African Development *(I or II, 3)*
466 (or PSC 466) Urban Problems *(II, 3)*
474 (or ENG 474) Topics in Pan-African Literature *(II, 3)*

APG Courses
Anthropology

400 Evolution, Culture, and Human Disease *(II, 3)*
401 History of Anthropological Theory *(I or II, 3)*
405 (or PSY 405) Psychological Anthropology *(I or II, 3)*
412 Primate Behavior and Organization *(I or II, 3)*
413 (or MAF 413) Peoples of the Sea *(I, 3)*
470 Problems in Anthropology *(I and II, 3)*

ART Courses
Art

405, 406 Studio Seminar *(I and II, 3 each)*

501 Graduate Studio Seminar *(I or II, 3)* Intensive independent studio work under guidance of instructors. Periodic critiques and discussions related to work of all participants in the course. *(Studio 6) Pre: 48 credits in studio.* Staff

ARH Courses
Art History

461 Topics in Methods, Theory, and Criticism *(I or II, 3)*
462 Contemporary Art Seminar: Art Since 1945 *(II, 3)*
469, 470 Art History: Senior Projects *(I and II, 3–6 each)*
480 Advanced Topics in European and American Art *(I or II, 3)*

COM Courses
Communication Studies

400 Rhetoric *(I, 3)*
403 Advanced Interpersonal Communication *(I, 3)*
415 The Ethics of Persuasion *(II, 3)*
420 Seminar in American Public Address and Criticism *(II, 3)*
430 Political Communication *(I, 3)*
435 Directing Group Performance of Nondramatic Literature *(II, 3)*
440 Telecommunications Processes and Audience Behavior *(I and II, 3)*
450 Organizational Communication *(I and II, 3)*
460 Communication and Conflict Intervention *(II, 3)*
471, 472 Internship in Communication Studies *(I and II, 1–3 each)*
491, 492 Special Problems *(I and II, 1–3 each)*

CNS Courses
Consumer Studies

401 Consumer and Managerial Problems of Families with Special Needs *(I or II, 3)*
420 Consumer Protection *(I or II, 3)*
422 Consumer Issues Research *(I or II, 3)*
457 (or HLT 457) Health and Safety Issues of Consumer Products *(I or II, 3)*
470 Special Problems *(I and II, 2–4)*

DHY Courses
Dental Hygiene

462 Oral Care of the Aged and Medically Compromised *(I, 3)*
464 Field Experience in Community Oral Health *(II, 3)*

Genetics Courses

Botany
454 Genetics Laboratory
554 Cytogenetics
579 Advanced Genetics Seminar

Microbiology
502 Techniques in Microbial and Molecular Genetics
552 Microbial Genetics
561 Recent Advances in Molecular Cloning

Plant Sciences
472 Plant Improvement

Zoology
518 Mechanisms of Development
573 Developmental Genetics
579 Advanced Genetics Seminar

Gerontology Courses

Human Development and Family Studies
420 Human Development During Adulthood
421 Death, Dying, and Bereavement
422 Aging: Case Coordination
431 Family and the Elderly
440 Environmental Context of Aging
520 Developmental Issues in Later Life
527 Health Care Policy and the Elderly
529 Practicum Seminar in Gerontology
555 Gerontological Counseling

Human Science and Services
530 Multidisciplinary Health Seminars for the Elderly

Dental Hygiene
462 Oral Care for the Aged and Medically Compromised

Adult and Extension Education
575 Adult and Cooperative Extension Programming for Older Adults

Education
410 Seminar and Supervised Field Practicum in Education of the Aging

Nursing
563 Advanced Clinical Study of Nursing Practice in Gerontology

Physical Education
563 Fitness Programs for the Middle-Aged and Elderly
564 Physiology of Aging

Sociology
438 Aging in Society

HED Courses
Home Economics Education

595 Master's Project: Action Research *(I and II, 1–6)* Candidates plan and carry out an action research project approved by the instructor. Number of credits is determined each semester in consultation with the major professor. *Pre: admission to a master's program in home economics education, a course in research methods, and permission of chairperson. May be repeated for a maximum of 6 credits.* Staff

JOR Courses
Journalism

410 Mass Media Issues *(I or II, 3)*
415 Perspectives on Reporting *(I or II, 3)*
420 Advanced Reporting and Writing *(I or II, 3)*
430 Advanced Television News *(I or II, 3)*
440 Independent Study *(I and II, 1–3)*
441 Public Relations Practices *(II, 3)*
445 Special Topics in Journalism *(I and II, 3)*

LAR Courses
Landscape Architecture

444 Landscape Architecture Studio III *(I, 4)*
491, 492 Special Projects and Independent Study *(I and II, 1–3 each)*

Latin American Studies Courses

Anthropology
470 Problems in Anthropology

History
580 Colloquium in Latin American History

Political Science
431 International Relations

Portuguese
497, 498 Directed Study

Spanish
487 Modern Spanish-American Narrative
497, 498 Directed Study
571 Modern Spanish-American Authors
572 Evolution of Spanish-American Culture and Thought
590 The Hispanic Presence in the United States

NES Courses
New England Studies

400 Special Topics in New England Studies *(SS, 1–3 each)*

SOC Courses
Sociology

401 History of Sociological Thought *(I or II, 3)*
408 Individual Life and Social Order *(I or II, 3)*
413 Sexual Inequality *(I or II, 3)*
420 Family Violence *(I or II, 3)*
424 Health Care Delivery Systems *(I or II, 3)*
428 Institutional Racism *(I, 3)*
432 (or LRS 432) Industrial Sociology *(I or II, 3)*
437 (or HCF 437) Law and Families in the United States *(I, 3)*
438 Aging in Society *(II, 3)*
452 Class and Power *(II, 3)*
470, 471 Independent Study *(I and II, 3 each)*
473 Topics in Sociological Research *(I and II, 3)*
474 (or PSC 474) Criminal Justice System *(II, 3)*

505 Public Program Evaluation
See Political Science 505.

521 (or PSC 531) Behavior Systems in Crime *(I, 3)* Criminal behavior studied in categories useful for sociological analysis. Linkages of criminal behavior systems to the larger society; behavior systems in causal theorizing, justice, prevention, and corrections. *(Seminar) Pre: 330 or equivalent. In alternate years.* Carroll

522 (or PSC 522) Issues in Corrections *(II, 3)* Justifications for punishment and corrections; historical development; intensive survey of current research on deterrence, effectiveness of treatment, prison, violence, and other issues. *(Seminar) Pre: 330, STA 308, SOC 507, or permission of instructor. In alternate years.* Carroll

595 Problems of Modernization in Developing Nations
See Resource Economics 595.

Statistics Courses

Economics
576 Econometrics

Electrical Engineering
584 Pattern Recognition

Industrial and Manufacturing Engineering
411 Probability for Engineers
412 Statistics for Engineers
513 Statistical Quality Control
533 Advanced Statistical Methods for Research and Industry
634 Design and Analysis of Industrial Experiments
635 Response Surfaces and Evolutionary Operations

Management Science
445 Managerial Applications of Simulation
450 Forecasting: Computer Applications
470 Managerial Decision Support Systems
475 Bayesian Statistics in Business
601, 602 Advanced Management Statistics
630 Management Statistics with SAS and Personal Computer Software
671 Methods of Business Research
674 Business Research Methods: Applied Multivariate Methods
675 Applied Time Series Methods and Business Forecasting
676 Applied Econometric Methods in Business
683 Business Decision Theory

Mathematics
451 Introduction to Probability and Statistics
452 Mathematical Statistics
456 Probability
550 Advanced Probability
551 Mathematical Statistics

Mechanical Engineering and Applied Mechanics
521 Reliability Analysis and Prediction

Psychology
517 Small N Designs
533 Advanced Quantitative Methods in Psychology
610 Parsimony Methods
612 Structural Modeling

Quantitative Business Analysis
530 Statistical Methods for Management

Resource Economics
576 Econometrics

Statistics
409 Statistical Methods in Research I
412 Statistical Methods in Research II
413 Data Analysis
415 Introduction to Experimental Design
416 Survey of Advanced Statistical Methods
491 Directed Study in Statistics
492 Special Topics in Statistics
500 Nonparametric Statistical Methods
501 Analysis of Variance and Variance Components
502 Applied Regression Analysis
517 Small N Designs
520 Fundamentals of Sampling and Applications
532 Experimental Design
541 Multivariate Statistical Methods
542 Discrete Multivariate Methods
550 Ecological Statistics
576 Econometrics
584 Pattern Recognition
591 Directed Study in Statistics
592 Special Topics in Statistics
610 Parsimony Methods
611 Linear Statistical Models
612 Structural Modeling
635 Response Surfaces and Evolutionary Operations

THE Courses
Theatre

481 Topics in Theatre *(I and II, 3)*
482 Theatre Architecture in Western and Non-Western Drama *(I, 3)*
483 Aesthetics and Criticism of the Theatre *(II, 3)*

URB Courses
Urban Affairs

498, 499 Urban Affairs Senior Seminar *(I and II, 3 each)*

WMS Courses
Women's Studies

400 Critical Issues and Feminist Scholarship *(I or II, 3)*
450 Independent Study *(I and II, 3)*

PERSONNEL

The Graduate School

Kent Morrison, *Dean*
Vincent C. Rose, *Associate Dean*
Joan M. Onosko, *Executive Assistant*

The Graduate Council

Kent Morrison, *Chairperson, Ex Officio*
Peter August, *Natural Resources Science (1996)*
John Boulmetis, *Education (1995)*
Anita Bucsay, *Pharmacy (1995)*
Gary Burkholder, *Psychology (1995)*
Laura Beauvais, *Management (1997)*
Robin Devin, *Library (1995)*
James Fasching, *Chemistry (1997)*
Marian Goldsmith, *Zoology (1995)*
Mark Kenyon, *Human Development and Family Studies (1995)*
Janet Kulberg, *Psychology (1996)*
Margaret McGrath, *Nursing (1997)*
Matthew Roy, *Business Administration (1995)*
Michael Pilson, *Oceanography (1997)*
Zahir Shaikh, *Pharmacology (1995)*
Peter Swaszek, *Electrical Engineering (1995)*
George Tremblay, *Biochemistry (1995)*
Remo Trivelli, *Languages (1997)*
Ulysses Whitworth, *Fisheries, Animal and Veterinary Science (1996)*

Academic Administrators

Robert L. Carothers, *President*
M. Beverly Swan, *Provost and Vice President for Academic Affairs*
Kent Morrison, *Dean of the Graduate School*
Margaret S. Leinen, *Dean of the Graduate School of Oceanography and Vice Provost for Marine Programs*
Steffen H. Rogers, *Dean of the College of Arts and Sciences*
Frank S. Budnick, *Interim Dean of the College of Business Administration*
Walter A. Crocker, Jr., *Dean of the College of Continuing Education*
Thomas J. Kim, *Dean of the College of Engineering*
Barbara Brittingham, *Dean of the College of Human Science and Services and Interim Dean of University Libraries*
Louis A. Luzzi, *Dean of the College of Pharmacy*
Jean R. Miller, *Dean of the College of Nursing*
Robert H. Miller, *Dean of the College of Resource Development*
Diane W. Strommer, *Dean of University College and Director of Special Academic Programs*
David G. Taggart, *Dean of Undergraduate Admissions and Student Financial Aid*

Board of Governors for Higher Education

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Americo W. Petrocelli, *Commissioner of Higher Education*

Faculty

First date after title indicates appointment to present position; the second date, when the first fails to do so, indicates first appointment in the University.

Abushanab, Elie, *Professor of Medicinal Chemistry and Chemistry, 1979, 1970.*
Adams, Jerome F., *Associate Professor of Human Development and Family Studies, 1994, 1989.*
Ageloff, Roy, *Associate Professor of Management Science, 1977, 1972.*
Agostinucci, James, *Assistant Professor of Physical Therapy, 1992.*
Albert, Alexa, *Associate Professor of Sociology and Anthropology, 1987, 1982.*
Alm, Steven R., *Associate Professor of Plant Sciences, 1993, 1987.*
Amador, Jose A., *Assistant Professor of Natural Resources Science, 1992.*
Anderson, James L., *Professor of Resource Economics, 1994, 1983.*
Anderson, Joan Gray, *Associate Professor of Consumer Studies and Human Development and Family Studies, 1990, 1984.*
Anderson, Judith L., *Professor of Communication Studies and Women's Studies, 1982, 1970.*
Arakelian, Paul G., *Professor of English, 1993, 1976.*
Arimoto, Richard, *Associate Research Professor of Oceanography, 1992, 1982.*
Armstrong, Charles P., *Professor of Management Science and Information Systems, 1981, 1971.*
Aronian, Sona, *Professor of Russian and Women's Studies, 1987, 1970.*
Atash, Farhad, *Associate Professor of Community Planning and Area Development, 1991, 1985.*
August, Peter V., *Associate Professor of Natural Resources Science, 1989, 1985.*
Babson, John R., *Associate Professor of Pharmacology and Toxicology and of Biochemistry, 1992, 1988.*
Barbour, Marilyn McFarland, *Associate Professor of Pharmacy, 1991.*
Barker, Walter L., *Professor of English, 1992, 1966.*
Barnett, Harold, *Professor of Economics, 1986, 1970.*
Barnett, Stanley M., *Professor of Chemical Engineering, Food Science and Technology, and Pharmaceutics, 1980, 1969.*
Barton, James F., *Assistant Professor of Education, 1990.*
Baudet, Gerard M., *Associate Professor of Computer Science, 1987.*

Beaupre, Walter J., *Professor of Communicative Disorders, 1968.*
Beauregard, Raymond A., *Professor of Mathematics, 1982, 1968.*
Beauvais, Laura, *Associate Professor of Management, 1992, 1984.*
Beck, Cheryl, R.N., *Associate Professor of Nursing, 1992.*
Beckman, Judy K., *Assistant Professor of Accounting, 1992.*
Bender, Michael L., *Professor of Oceanography, 1982, 1972.*
Bengtson, David A., *Assistant Research Professor of Zoology, 1989.*
Berman, Allan, *Professor of Psychology, 1976, 1968.*
Bibb, Harold D., *Associate Professor of Zoology, 1978, 1972.*
Bide, Martin J., *Associate Professor of Textiles, Fashion Merchandising, and Design, 1991.*
Biller, Henry B., *Professor of Psychology, 1975, 1970.*
Blanpied, Peter R., *Assistant Professor of Physical Therapy, 1989.*
Bloomquist, Lorraine C., *Professor of Physical Education, 1985, 1967.*
Bonner, Jill C., *Professor of Physics, 1981, 1976.*
Boothroyd, Geoffrey, *Professor of Industrial and Manufacturing Engineering, 1985.*
Boothroyd, Jon C., *Professor of Geology, 1986, 1975.*
Bose, Arijit, *Professor of Chemical Engineering, 1992, 1982.*
Boudreaux-Bartels, Gloria F., *Professor of Electrical Engineering, 1993, 1983.*
Boulmetis, John, *Associate Professor of Education, 1991, 1977.*
Boyle, Edmund J., *Associate Professor of Accounting, 1994, 1988.*
Bradley, Terence M., *Associate Professor of Fisheries, Animal and Veterinary Science and of Biochemistry, Microbiology, and Molecular Genetics, 1989, 1983.*
Brady, Susan A., *Associate Professor of Psychology, 1989, 1982.*
Briggs, Josiah Morton, *Professor of History, 1975, 1969.*
Brittingham, Barbara, *Dean of the College of Human Science and Services and Professor of Education, 1993, 1973.*
Brown, Christopher W., *Professor of Chemistry, 1976, 1968.*
Brown, James Henry, Jr., *Professor of Natural Resources Science, 1980, 1958.*
Brown, Phyllis R., *Professor of Chemistry, 1980, 1973.*
Brown, Richard, *Professor of Materials and Chemical Engineering, 1991, 1981.*
Brownell, Winifred E., *Associate Dean of the College of Arts and Sciences and Professor of Communication Studies, 1989, 1977.*
Budnick, Frank S., *Professor of Management Science, 1982, 1971.*
Bullock, Robert Craig, *Professor of Zoology, 1990, 1974.*
Burbank, Patricia M., *Assistant Professor of Nursing, 1982.*
Burke, Sally F., *Associate Professor of English and Women's Studies, 1991, 1967.*
Burkett, John P., *Professor of Economics, 1992, 1981.*
Burroughs, Richard, *Associate Professor of Marine Affairs, 1989, 1983.*
Byrd, David M., *Associate Professor of Education, 1991, 1989.*
Cabelli, Victor J., *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1979.*
Cain, J. Allan, *Professor of Geology, 1971, 1966.*
Caldwell, Marjorie J., *Professor of Food Science and Nutrition, 1992, 1972.*
Campbell, Josie P., *Professor of English, College of Continuing Education, and Women's Studies, 1985, 1972.*
Campbell, Norman A., *Professor of Pharmacy Administration, 1976, 1970.*
Cane, Walter, *Associate Professor of English, College of Continuing Education, 1974, 1967.*
Cappello, Mary C., *Assistant Professor of English, 1991.*
Carey, Steven N., *Assistant Research Professor of Oceanography, 1987.*
Carney, Edward J., *Professor of Computer Science and Statistics, 1974, 1967.*
Carothers, Robert L., *President and University Professor, 1991.*
Carrano, Frank M., *Associate Professor of Computer Science, 1975, 1969.*
Carroll, Leo, *Professor of Sociology, 1982, 1972.*
Carson, C. Herbert, *Associate Professor of Library and Information Studies, 1993, 1986.*
Caruso, David A., *Associate Professor of Human Development and Family Studies, 1992, 1989.*
Casagrande, Richard A., *Professor of Plant Sciences, 1989, 1976.*
Chandlee, Joel M., *Associate Professor of Plant Sciences and of Biochemistry, Microbiology, and Molecular Genetics, 1994, 1988.*
Chang, Rosita P., *Codirector, Pacific-Basin Capital Markets Research Center, and Associate Professor of Finance and Insurance, 1988, 1982.*
Chartier, Armand B., *Professor of French, 1988, 1971.*
Cheer, Clair J., *Professor of Chemistry, 1983, 1968.*
Chen, Ching-Shih, *Associate Professor of Pharmacognosy, 1991, 1987.*
Chen, Shaw K., *Associate Professor of Management Science and Information Systems, 1992, 1986.*
Chichester, Clinton O., III, *Associate Professor of Pharmacology and Toxicology, 1987, 1981.*
Cho, Bongsup P., *Assistant Professor of Medicinal Chemistry, 1991.*
Clark, Dean S., *Associate Professor of Mathematics, 1988, 1984.*
Clark, Phillip G., *Professor of Human Development and Family Studies, 1994, 1981.*
Coates, Norman, *Professor of Management, 1971.*
Cobb, J. Stanley, *Professor of Zoology, 1981, 1970.*
Cohen, Greta L., *Professor of Physical Education and Women's Studies, 1992, 1975.*
Cohen, Jerry L., *Professor of Psychology, 1989, 1980.*
Cohen, Joel A., *Professor of History, 1979, 1965.*
Cohen, Paul Sidney, *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1975, 1966.*
Cohen, Stewart, *Professor of Human Development and Family Studies, 1978, 1972.*
Collie, Jeremy S., *Associate Professor of Oceanography, 1993.*
Collyer, Charles E., *Professor of Psychology, 1991, 1976.*
Comerford, Robert A., *Professor of Management, 1985, 1975.*
Constantinides, Spiros M., *Professor of Food Science and Nutrition, 1974, 1968.*
Cooper, Elizabeth A., *Associate Professor of Management, 1991, 1985.*
Cornillon, Peter C., *Professor of Oceanography and Ocean Engineering, 1990, 1981.*
Costantino, Robert F., *Professor of Zoology, 1978, 1972.*
Costigliola, Frank, *Professor of History, 1985, 1972.*
Croasdale, William, *Professor of Education, 1982, 1965.*
Crocker, Walter A., Jr., *Dean of the College of Continuing Education, 1984.*
Crooker, Jeannette E., *Associate Professor of Physical Education, 1967, 1955.*
Cuddy, Lois, *Professor of English and Women's Studies, 1989, 1978.*
Culatta, Barbara, *Professor of Communicative Disorders, 1989, 1983.*
Dain, Joel A., *Professor of Chemistry, 1973, 1962.*
Daly, James Caffrey, *Professor of Electrical Engineering, 1983, 1969.*
Daniel, Charles E., Jr., *Assistant Professor of History, 1968, 1967.*
Dash, Gordon H., Jr., *Associate Professor of Finance, 1979, 1974.*
Datseris, Philip, *Professor of Mechanical Engineering and Applied Mechanics, 1989, 1977.*
Datta, Dilip K., *Professor of Mathematics, 1981, 1967.*
DeAlteris, Joseph T., *Associate Professor of Fisheries, Animal and Veterinary Science, 1989, 1983.*
Della Bitta, Albert J., *Professor of Marketing, 1981, 1971.*
deLodzia, George, *Professor of Management, 1975, 1970.*
DeLuise, Frank, *Professor of Mechanical Engineering and Applied Mechanics, 1979, 1950.*
Dempsey, John David, *Professor of Music, 1982, 1973.*
Desjardins, John Scott, *Professor of Physics, 1976, 1960.*
Dewhurst, Peter, *Professor of Industrial and Manufacturing Engineering, 1985.*
Dholakia, Nikhilesh, *Professor of Marketing, 1984, 1981.*
Dholakia, Ruby Roy, *Director of Research Institute for Telecommunications and Information Marketing and Professor of Marketing, 1984, 1981.*
D'Hondt, Steven L., *Assistant Professor of Oceanography, 1989.*
Disney, Diane M., *Director of Research Center in Business and Economics and Associate Professor of Management, 1993, 1988.*
Doody, Agnes G., *Professor of Communication Studies, 1970, 1958.*
Driver, Rodney D., *Professor of Mathematics, 1974, 1969.*
Dudley, Michael N., *Professor of Pharmacy, 1993, 1983.*
Dufault, Marlene, *Assistant Professor of Nursing, 1990.*
Duff, Dale Thomas, *Associate Professor of Plant Sciences, 1975, 1967.*
Dufresne, Robert L., *Assistant Professor of Pharmacy, 1990.*
Dugal, Sanjiv, *Assistant Professor of Management, 1991, 1989.*
Dunn, John, *Associate Professor of Management, 1990, 1983.*
Durbin, Ann G., *Research Professor of Oceanography, 1993, 1980.*
Durbin, Edward G., *Research Professor of Oceanography, 1993, 1980.*
Dvorak, Wilfred P., *Professor of English, 1992, 1968.*
Eaton, Elizabeth Gale, *Associate Professor of Library and Information Studies, 1994, 1990.*
Eaton, Nancy, *Assistant Professor of Mathematics, 1992.*
Ebrahimpour, Maling, *Professor of Management Science, 1994, 1984.*

Eddleman, William R., *Associate Professor of Natural Resources Science, 1994, 1988.*
Emery, Joy Spanabel, *Professor of Theatre and Adjunct Professor of Textiles, Fashion Merchandising, and Design, 1984, 1968.*
Englander, Larry, *Associate Professor of Plant Sciences, 1981, 1972.*
English, Catherine, *Associate Professor of Food Science and Nutrition, 1994, 1985.*
Eshleman, Ruth E., *Associate Professor of Food Science and Nutrition, 1976.*
Estrin, Joseph, *Professor of Chemical Engineering, 1980.*
Euler, William B., *Professor of Chemistry, 1993, 1982.*
Faghri, Mohammad, *Professor of Mechanical Engineering and Applied Mechanics, 1989, 1983.*
Fasching, James L., *Professor of Chemistry, 1979, 1969.*
Fastovsky, David E., *Associate Professor of Geology, 1991, 1986.*
Faust, David, *Professor of Psychology, 1989.*
Feld, Marcia, *Professor of Community Planning and Area Development, 1988, 1975.*
Feldman, Marshall M., *Associate Professor of Community Planning and Area Development, 1993, 1987.*
Ferrante, William Robert, *Justin Smith Morrill University Professor and Professor of Mechanical Engineering and Applied Mechanics, 1972, 1956.*
Findlay, James F., Jr., *Professor of History, 1971.*
Finizio, Norman J., *Professor of Mathematics, 1994, 1963.*
Fischer, Godi, *Associate Professor of Electrical Engineering, 1991, 1985.*
Fischl, Anthony S., *Assistant Professor of Food Science and Nutrition and of Biochemistry, Microbiology, and Molecular Genetics, 1990.*
Fisher, Harold W., *Professor of Chemistry and Microbiology, 1968, 1963.*
Florin, Paul Richard, *Professor of Psychology, 1993, 1981.*
Fortin, Jacqueline D., R.N., *Associate Professor of Nursing, 1985, 1975.*
Foster, Cheryl A., *Assistant Professor of Philosophy, 1992.*
Foster, Howard H., Jr., *Associate Professor of Community Planning and Area Development, 1973, 1963.*
Fox, Paul J., *Research Professor of Oceanography, 1984, 1981.*
Fraleigh, John Blackmon, *Professor of Mathematics, 1978, 1962.*
Freeman, David L., *Professor of Chemistry, 1988, 1976.*
Frohlich, Reinhard K., *Associate Professor of Geology, 1979, 1973.*
Fuchs, Henry Carl, *Professor of Music, 1985, 1968.*
Futas, Elizabeth, *Director of Graduate School of Library and Information Studies and Professor, Library, 1986.*
Gamerdinger, Amy P., *Assistant Professor of Natural Resources Science, 1990.*
Garey, Marion, A., R.N., *Associate Professor of Nursing, 1985.*
Gates, John M., *Professor of Resource Economics, 1982, 1969.*
Geiger, Marshall A., *Associate Professor of Accounting, 1993, 1991.*
Gelles, Richard J., *Professor of Sociology and Psychology, 1983, 1973.*
Geletko, Sandra, *Assistant Professor of Pharmacy Practice, 1990.*
Genest, Marc A., *Instructor of Political Science, 1991.*
Gerber, Leonard E., *Associate Professor of Food Science and Nutrition, 1991, 1981.*
Ghonem, Hamouda, *Professor of Mechanical Engineering and Applied Mechanics, 1986, 1981.*
Gibbs, Geoffrey David, *Professor of Music, 1983, 1965.*
Gilton, Donna, *Assistant Professor, Library, 1992.*
Gititi, Gitahi, *Assistant Professor of English and African and Afro-American Studies, 1991.*
Gitlitz, David M., *Professor of Spanish, 1988.*
Glaze, Gary, *Associate Professor of Music, 1991.*
Gold, Arthur J., *Professor of Natural Resources Science, 1993, 1983.*
Goldsmith, Marian R., *Associate Professor of Zoology and of Biochemistry, Microbiology, and Molecular Genetics, 1983, 1980.*
Golet, Francis C., *Professor of Natural Resources Science, 1991, 1972.*
Goos, Roger D., *Professor of Botany, 1972, 1970.*
Gordon, William R., Jr., *Assistant Professor of Marine Affairs, 1991.*
Grandin, John M., *Professor of German, 1987, 1970.*
Gray, Donald J., *Associate Professor of Chemical Engineering, 1987, 1980.*
Grebstein, Lawrence C., *Professor of Psychology and Director of Clinical Psychology Training, 1975, 1964.*
Greene, Geoffrey Walker, *Associate Professor of Food Science and Nutrition, 1990.*
Gregory, Otto J., *Professor of Chemical Engineering, 1993, 1982.*
Grigalunas, Thomas A., *Professor of Resource Economics, 1984, 1971.*
Grilli, Stephan, *Associate Professor of Ocean Engineering, 1993, 1991.*
Gross, Ira, *Professor of Psychology and Women's Studies, 1983, 1967.*
Grove, Edward A., *Professor of Mathematics, 1988, 1968.*
Grubman-Black, Stephen David, *Professor of Communicative Disorders and Women's Studies, 1993, 1972.*
Gutchen, Robert M., *Professor of History, 1976, 1964.*
Hagelberg, Terri K., *Assistant Professor of Oceanography, 1994.*
Hamilton, Cynthia, *Associate Professor of Political Science and Director of African and Afro-American Studies Program, 1992.*
Hammadou, JoAnne, *Associate Professor of Languages, 1993, 1988.*
Hanumara, R. Choudary, *Professor of Statistics, 1988, 1968.*
Hara, Tetsu, *Assistant Professor of Oceanography, 1992.*
Hargraves, Paul E., *Professor of Oceanography and Botany, 1987, 1968.*
Harlam, Bari A., *Assistant Professor of Marketing, 1992.*
Harlin, Marilyn, *Professor of Botany, 1983, 1971.*
Harlow, Lisa L., *Associate Professor of Psychology, 1991, 1985.*
Harps-Logan, Yvette, *Assistant Professor of Textiles, Fashion Merchandising, and Design, 1989.*
Harris, Ovetta L., *Assistant Professor of Communicative Disorders, 1992.*
Harris, Shanette, *Assistant Professor of Psychology, 1994.*
Hartman, Karl A., Jr., *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1976, 1967.*
Hartt, Kenneth L., *Professor of Physics, 1983, 1966.*
Hazera, Alejandro, *Assistant Professor of Accounting, 1990, 1988.*
Hebert, David, *Assistant Professor of Oceanography, 1992.*
Hedlund, Ronald D., *Vice Provost for Research, 1989.*
Heikes, Brian G., *Associate Professor of Oceanography, 1994, 1988.*
Helms, Patricia Ann, *Associate Professor of Textiles, Fashion Merchandising, and Design, 1976, 1971.*
Heltshe, James F., *Professor of Statistics, 1985, 1973.*
Hennessey, Timothy M., *Professor of Political Science, 1978, 1976.*
Heppner, Frank H., *Professor of Zoology, 1979, 1969.*
Hermes, O. Don, *Professor of Geology, 1978, 1968.*
Heskett, David, *Associate Professor of Physics, 1994, 1988.*
Hickox, Charles, *Associate Professor of Management, 1990, 1984.*
Hicks, Sandy J., *Assistant Professor of Education, 1993.*
Higa, Misako, *Associate Professor of Textiles, Fashion Merchandising, and Design, 1984, 1977.*
Higgins, Mark, *Associate Professor of Accounting, 1993, 1988.*
Hill, Robert B., *Professor of Zoology, 1975, 1968.*
Hills, Mathilda M., *Associate Professor of English and Women's Studies, 1977, 1970.*
Hirsch, Janet I., R.N., *Professor of Nursing, 1983, 1971.*
Holmes, Wendy B., *Professor of Art, 1990, 1974.*
Honhart, Michael W., *Associate Professor of History, 1991, 1971.*
Horm-Wingerd, Diane M., *Associate Professor of Human Development and Family Studies, 1993, 1987.*
Hu, Sau-Lon James, *Associate Professor of Ocean Engineering, 1991, 1984.*
Hufnagel, Linda A., *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1986, 1973.*
Hull, Richard J., *Professor of Plant Sciences, 1979, 1969.*
Hume, Anne L., *Associate Professor of Pharmacy, 1991, 1985.*
Humphrey, Alan B., *Professor of Management Science and Information Systems, 1992, 1978.*
Husband, Thomas P., *Professor of Natural Resources Science, 1991, 1977.*
Hyland, Kerwin Ellsworth, Jr., *Professor of Zoology, 1966, 1953.*
Ibrahim, Osama, *Assistant Professor of Mechanical Engineering and Applied Mechanics, 1992.*
Jackson, Leland B., *Professor of Electrical Engineering, 1979, 1974.*
Jackson, Noel, *Professor of Plant Sciences, 1975, 1965.*
Jacobs, Dorothy, *Associate Professor of English, 1984, 1968.*
Jain, Kapil, *Assistant Professor of Marketing, 1989, 1987.*
Jarrett, Jeffrey E., *Professor of Management Science, 1974, 1971.*
Jensen, Marjorie E. (Munafo), *Associate Professor of Community Planning and Area Development, 1992, 1980.*
Johnson, Eugene M., *Professor of Marketing, 1975, 1971.*
Johnson, Galen A., *Professor of Philosophy, 1987, 1976.*
Joseph, Dayle Hunt, R.N., *Assistant Dean of the College of Nursing and Associate Professor of Nursing, 1991, 1973.*
Jouaneh, Musa K., *Assistant Professor of Mechanical Engineering, 1990.*

Juda, Lawrence, *Professor of Marine Affairs, 1984, 1977.*
Kahn, Leonard M., *Professor of Physics, 1992, 1980.*
Kalymun, Mary, *Assistant Professor of Human Development and Family Studies, 1974.*
Kang, Jun-Koo, *Assistant Professor of Accounting, 1991.*
Kanyok, Thomas P., *Assistant Professor of Pharmacy Practice, 1993.*
Karamanlidis, Dimitrios, *Associate Professor of Civil and Environmental Engineering, 1990, 1983.*
Kaskosz, Barbara, *Professor of Mathematics, 1994, 1984.*
Kass-Simon, Gabriele, *Professor of Zoology, 1990, 1973.*
Kaufman, Charles, *Professor of Physics, 1983, 1964.*
Kay, Steven M., *Professor of Electrical Engineering, 1990, 1980.*
Kellogg, Theodore M., *Professor of Education, 1993, 1970.*
Kelly, Colleen, *Assistant Professor of Statistics, 1992, 1991.*
Kent, George Edgar, *Professor of Music, 1980, 1969.*
Kester, Dana R., *Professor of Oceanography, 1976, 1969.*
Ketrow, Sandra M., *Associate Professor of Communication Studies, 1992, 1986.*
Killilea, Alfred G., *Professor of Political Science, 1980, 1969.*
Killingbeck, Keith T., *Professor of Botany, 1990, 1979.*
Kim, Chai, *Director of Institute for International Business and Professor of Management Science and Information Systems, 1981.*
Kim, Chong Sun, *Professor of History, 1979, 1965.*
Kim, Hesook Susie (Mrs. Park), R.N., *Professor of Nursing, 1983, 1973.*
Kim, Thomas Joon-Mock, *Dean of the College of Engineering and Professor of Mechanical Engineering and Applied Mechanics, 1979, 1968.*
Kim, Yong Choon, *Professor of Philosophy, 1979, 1971.*
Kincaid, Christopher R., *Assistant Professor of Oceanography, 1991.*
King, John W., *Associate Professor of Oceanography, 1992, 1984.*
Kirschenbaum, Louis J., *Professor of Chemistry, 1983, 1970.*
Kislalioglu, Serpil, *Professor of Pharmaceutics, 1994, 1988.*
Klein, Maurice Nickell, *Professor of History, 1973, 1964.*
Knickle, Harold Norman, *Associate Dean and Professor of Chemical Engineering, 1982, 1969.*
Knight, Winston A., *Professor of Industrial and Manufacturing Engineering, 1985.*
Koske, Richard E., *Professor of Botany, 1990, 1978.*
Kovacs, William D., *Professor of Civil and Environmental Engineering, 1984.*
Kowalski, James G., *Associate Professor of Philosophy and Computer Science, 1978, 1971.*
Koza, Russell C., *Professor of Management Science, 1979, 1977.*
Krausse, Gerald H., *Assistant Professor of Marine Affairs, 1975, 1973.*
Krueger, William H., *Associate Professor of Zoology, 1973, 1964.*
Krul, William R., *Associate Professor of Plant Sciences and of Biochemistry, Microbiology, and Molecular Genetics, 1977.*
Kuhn, Ira A., *Associate Professor of French, 1977, 1967.*
Kulberg, Janet, *Professor of Psychology, 1989, 1974.*
Kumaresan, Ramdas, *Professor of Electrical Engineering, 1992, 1983.*
Kunz, Don R., *Professor of English, 1982, 1968.*
Ladas, Gerasimos, *Professor of Mathematics, 1975, 1969.*
Ladewig, James L., *Professor of Music, 1994, 1985.*
Lai, Gene C., *Associate Professor of Finance and Insurance, 1993, 1988.*
Lamagna, Edmund A., *Professor of Computer Science, 1994, 1976.*
Lamont, Linda S., *Assistant Professor of Physical Education, 1993.*
Lardaro, Leonard P., *Associate Professor of Economics,* 1987, 1981.
Larson, Roger L., *Professor of Oceanography, 1980.*
Latos, Charles, *Assistant Professor of Economics, College of Continuing Education, 1977, 1969.*
Lausier, Joan M., *Associate Dean of the College of Pharmacy and Professor of Pharmaceutics, 1987, 1971.*
Laux, David Charles, *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1984, 1973.*
Laviano, Andrew, *Professor of Business Law, 1991, 1978.*
Lawing, William Dennis, Jr., *Associate Professor of Industrial Engineering and Statistics, 1969.*
LeBrun, Roger A., *Professor of Plant Sciences, 1993, 1977.*
Leduc, Edgar Clarence, *Professor of Political Science, 1976, 1969.*
Lee, Chong Min, *Professor of Food Science and Nutrition, 1988, 1980.*
Lee, Kang Won, *Professor of Civil and Environmental Engineering, 1993, 1985.*
Lee, Ronald T., *Professor of Music, 1992.*
Lee, Yul W., *Assistant Professor of Finance and Insurance, 1992.*
Leinen, Margaret S., *Dean of the Graduate School of Oceanography, Vice Provost for Marine Programs, and Professor of Oceanography, 1989, 1982.*
Lengyel, Gabriel, *Professor of Electrical Engineering, 1971, 1966.*
Leo, John R., *Professor of English, 1990, 1973.*
Lessmann, Richard C., *Professor of Mechanical Engineering and Applied Mechanics, 1983, 1969.*
Letcher, Stephen Vaughan, *Professor of Physics, 1975, 1963.*
Lewis, James T., *Professor of Mathematics, 1981, 1969.*
Lindgren, Allen G., *Professor of Electrical Engineering, 1970, 1964.*
Liu, Pan-Tai, *Professor of Mathematics, 1979, 1968.*
Livingston, Carolyn, *Associate Professor of Music, 1993, 1989.*
Lo, Jien-Chung, *Associate Professor of Electrical Engineering, 1994, 1989.*
Logan, Patrick A., *Interim Associate Dean of the College of Resource Development and Professor of Plant Sciences, 1994, 1977.*
Long, John V., Jr., *Professor of Education, 1979, 1971.*
Lord, Blair Morrill, *Vice Provost for Academic Programs and Services and Associate Professor of Finance and Insurance, 1981, 1976.*
Lott, Albert J., *Professor of Psychology, 1969.*
Lott, Bernice, *Professor of Psychology and Women's Studies, 1975, 1970.*
Loy, James D., *Professor of Anthropology, 1984, 1974.*
Luebke, Barbara F., *Professor of Journalism and Women's Studies, 1993, 1989.*
Luzzi, Louis A., *Dean of the College of Pharmacy and Professor of Pharmacy, 1981.*
Lynch, Robert N., *Assistant Professor of Anthropology, 1971, 1970.*
MacLaine, Allan Hugh, *Professor of English, 1962.*
MacMillan, Robert W., *Professor of Education, 1972, 1966.*
Malik, Surendra S., *Professor of Physics, 1974, 1962.*
Manfredi, Thomas G., *Professor of Physical Education, 1988, 1982.*
Mangiameli, Paul M., *Professor of Management Science and Information Systems, 1992, 1977.*
Manteiga, Robert, *Professor of Hispanic Studies, 1988, 1976.*
Maranda, Lucie, *Assistant Research Professor of Pharmacognosy and Environmental Health Sciences, 1991.*
Marcus, Alan Samuel, *Associate Professor of Civil and Environmental Engineering, 1977, 1969.*
Mardix, Shmuel, *Professor of Electrical Engineering, 1978, 1970.*
Marti, Bruce E., *Professor of Marine Affairs, 1994, 1980.*
Martin, Celest A., *Associate Professor of English, 1984, 1979.*
Martin, Lenore M., *Assistant Professor of Pharmacognosy, 1994.*
Martin, Spencer J., *Professor of Accounting, 1980, 1970.*
Maslyn, David C., *University Archivist, Special Collections Librarian, and Professor, Library, 1983, 1974.*
Mather, Thomas N., *Associate Professor of Plant Sciences, 1993.*
Mathews, Francis X., *Professor of English, 1977, 1967.*
Matoney, Joseph P., Jr., *Professor of Accounting, 1983, 1973.*
Maynard, Brian K., *Assistant Professor of Plant Sciences, 1992.*
Maynard, Peter E., *Professor of Human Development and Family Studies, 1981, 1971.*
McCabe, Thomas H., *Associate Professor of English, 1974, 1965.*
McCarthy, Cheryl, *Assistant Professor of Library and Information Studies, 1992.*
McEwen, Everett E., *Professor of Civil and Environmental Engineering, 1984, 1967.*
McGrath, Margaret, R.N., *Associate Professor of Nursing, 1989, 1985.*
McIntyre, Richard, *Associate Professor of Economics, 1992, 1989.*
McKinney, William Lynn, *Professor of Education, 1993, 1972.*
McLeavey, Dennis W., *Professor of Finance and Insurance, 1984, 1976.*
McNab, Gregory R., Jr., *Professor of Portuguese, 1989, 1971.*
Mead, Arthur C., *Associate Professor of Economics, 1984, 1976.*
Mederer, Helen J., *Associate Professor of Sociology, 1993, 1986.*
Mensel, William Langley, Jr., *Assistant Professor of English, 1973, 1969.*
Merino, Orlando, *Assistant Professor of Mathematics, 1993.*
Merrill, John T., *Associate Research Professor of Oceanography, 1987.*
Meyerovich, Alexander E., *Professor of Physics, 1992, 1989.*
Miller, Carole F., *Associate Professor of Economics, 1994, 1986.*
Miller, Jean R., *Dean of the College of Nursing and Professor of Nursing, 1988.*

Miller, Robert H., *Dean of the College of Resource Development, Director of Cooperative Extension, and Professor of Natural Resources Science, 1989.*
Mitra, Shashanka S., *Professor of Electrical Engineering, 1965.*
Moakley, Maureen F., *Assistant Professor of Political Science, 1992.*
Mojena, Richard, *Professor of Management Science and Information Systems, 1981, 1971.*
Molloy, D. Scott, *Assistant Professor of Labor and Industrial Relations, 1991, 1986.*
Montgomery, John T., *Professor of Mathematics, 1984, 1973.*
Moran, Bradley, *Assistant Professor of Oceanography, 1993.*
Morello, Joseph G., *Associate Professor of French, 1979, 1968.*
Morín, Thomas D., *Associate Professor of Hispanic Studies, 1980, 1975.*
Morokoff, Patricia, *Associate Professor of Psychology, 1990, 1987.*
Morrison, Kent, *Dean of the Graduate School, 1989.*
Mottinger, John P., *Associate Professor of Botany and Zoology and of Biochemistry, Microbiology, and Molecular Genetics, 1974, 1968.*
Mueller, Walter C., *Professor of Plant Sciences, 1974, 1961.*
Muller, Gerhard, *Professor of Physics, 1991, 1984.*
Murray, Daniel P., *Associate Professor of Geology, 1989, 1983.*
Narasimhan, Seetharama, *Professor of Management Science, 1984, 1979.*
Navascués, Michael, *Professor of Hispanic Studies, 1988, 1968.*
Nedwidek, Raymond Albert, *Professor of Physical Education, 1976, 1965.*
Needham, Thomas E., *Director, Drug Delivery Research and Development Laboratory, and Professor of Pharmaceutics, 1989.*
Nelson, David R., *Associate Professor of Biochemistry, Microbiology, and Molecular Genetics, 1988, 1982.*
Nelson, Richard G., *Associate Professor of Education, 1978, 1972.*
Nelson, Wilfred H., *Professor of Chemistry, 1977, 1964.*
Neuse, Richard Thomas, *Professor of English, 1970, 1956.*
Nightingale, M. Peter, *Professor of Physics, 1991, 1983.*
Nippo, Mum M., *Professor of Fisheries, Animal and Veterinary Science, 1994, 1972.*
Nixon, Dennis W., *Associate Professor of Marine Affairs, 1987, 1976.*
Nixon, Scott W., *Director of Rhode Island Sea Grant College Program and Professor of Oceanography, 1980, 1970.*
Norris, Joanna Hanks, *Assistant Professor of Botany and of Biochemistry, Microbiology, and Molecular Genetics, 1987.*
Northby, Jan A., *Professor of Physics, 1979, 1970.*
Nunes, Anthony C., *Professor of Physics, 1982, 1976.*
O'Donnell, Leo E., *Associate Dean of the College of Human Science and Services and Associate Professor of Physical Education, 1976, 1972.*
Ohley, William J., *Professor of Electrical Engineering, 1991, 1976.*
Okeke-Ezigbo, F.E., *Associate Professor of English, 1994, 1992.*
O'Leary, John Louis, *Associate Professor of Physical Education, 1976, 1957.*
Olson, Daniel G., *Associate Professor of Mechanical Engineering and Applied Mechanics, 1993, 1987.*
Opaluch, James J., *Professor of Resource Economics, 1990, 1979.*
Oppenheimer, Henry R., *Associate Professor of Finance and Insurance, 1987.*
Ordonez, Margaret, *Associate Professor of Textiles, Fashion Merchandising, and Design, 1994, 1988.*
Overton, Craig E., *Professor of Management, 1981, 1969.*
Oviatt, Candace A., *Research Professor of Oceanography, 1982, 1970.*
Owens, Norma J., *Associate Professor of Pharmacy, 1989, 1982.*
Pakula, Lewis I., *Professor of Mathematics, 1993, 1973.*
Palm, William J., *Professor of Mechanical Engineering and Applied Mechanics, 1987, 1970.*
Panzica, Raymond P., *Professor of Medicinal Chemistry and Chemistry, 1986, 1976.*
Pasquerella, Lynn, *Associate Professor of Philosophy, 1991, 1986.*
Pearlman, Daniel D., *Professor of English, 1980.*
Peckham, Joan M., *Assistant Professor of Computer Science, 1990.*
Pegueros, Rosemarie, *Assistant Professor of History, 1993.*
Peters, Calvin B., *Professor of Sociology, 1991, 1978.*
Peterson, John F., Jr., *Professor of Philosophy, 1979, 1964.*
Peterson, Karen I., *Associate Professor of Chemistry, 1992, 1986.*
Petro, Nicolai N., *Assistant Professor of Political Science, 1991.*
Pickart, Stanley Joseph, *Professor of Physics, 1974.*
Pilson, Michael E.Q., *Professor of Oceanography, 1978, 1966.*
Poggie, John J., Jr., *Professor of Anthropology, 1975, 1969.*
Polidoro, J. Richard, *Associate Professor of Physical Education and Health, 1975, 1969.*
Pollart, Gene John, *Professor of Music, 1983, 1976.*
Pollnac, Richard B., *Professor of Anthropology, 1982, 1973.*
Poon, Calvin Po-Chuen, *Professor of Civil and Environmental Engineering, 1975, 1965.*
Power, Jeffrey W., *Assistant Professor of Accounting, 1991, 1989.*
Preece, John P., *Associate Professor of Communicative Disorders, 1994, 1992.*
Prochaska, James Otto, *Professor of Psychology, 1977, 1969.*
Purnell, Richard F., *Professor of Education, 1977, 1970.*
Quina, Kathryn, *Professor of Psychology and Women's Studies, College of Continuing Education, 1990, 1978.*
Quinn, James G., *Professor of Oceanography, 1978, 1968.*
Rae, Gwenneth, *Professor of Human Development and Family Studies, 1982, 1973.*
Rahn, Kenneth A., *Research Professor of Oceanography, 1983, 1980.*
Ramsay, Glenworth A., *Professor of Economics, 1993, 1973.*
Ramstad, Yngve, *Professor of Economics, 1994, 1982.*
Rand, Arthur Garth, Jr., *Professor of Food Science and Nutrition, 1975, 1963.*
Randall, Linda M., *Assistant Director of the Institute for International Business and Assistant Professor of Management, 1993.*
Rankin, W. Donald, *Professor of Music, 1979, 1963.*
Ravikumar, Bala, *Associate Professor of Computer Science, 1992, 1989.*
Reaves, RB, Jr., *Associate Professor of English, 1975, 1968.*
Recksiek, Conrad W., *Associate Professor of Fisheries, Animal and Veterinary Science, 1980.*
Reilly, Mary Ellen, *Director of Women's Studies and Professor of Sociology and Women's Studies, 1987, 1973.*
Reynolds, Nedra, *Assistant Professor of English, 1991.*
Rhee, S. Ghon, *Codirector of the Pacific-Basin Capital Markets Research Center and Professor of Finance and Insurance, 1989, 1983.*
Rhoads, Dennis E., *Associate Professor of Biochemistry, Microbiology, and Molecular Genetics, 1991, 1985.*
Rhodes, Christopher T., *Professor of Pharmaceutics, 1975.*
Rhodes, Richard C., III, *Professor of Fisheries, Animal and Veterinary Science, 1994, 1982.*
Rice, Michael A., *Associate Professor of Fisheries, Animal and Veterinary Science, 1993, 1987.*
Richmond, Jayne E., *Associate Professor of Human Development and Family Studies, 1990, 1986.*
Rivero-Hudec, Mercedes A., *Assistant Professor of Chemical Engineering, 1991.*
Roberts, Alison Wille, *Assistant Professor of Botany, 1991.*
Roberts, Catherine A., *Assistant Professor of Mathematics, 1992.*
Roberts, Mark S., *Assistant Professor of Philosophy, 1990.*
Robinson, Deirdre E., *Assistant Professor of Physical Therapy, 1991, 1989.*
Rockett, Thomas J., *Professor of Materials and Chemical Engineering, 1982, 1971.*
Rodgers, Robert L., *Associate Professor of Pharmacology and Toxicology, 1987, 1981.*
Rogers, Kenneth H., *Professor of French and Linguistics, 1984, 1968.*
Rogers, Steffen H., *Dean of the College of Arts and Sciences and Professor of Zoology, 1991.*
Rolley, Gerry, *Assistant Professor of Human Development and Family Studies, 1992.*
Rose, Vincent C., *Associate Dean of the Graduate School and Professor of Nuclear and Ocean Engineering, 1983, 1963.*
Rosen, Deborah E., *Assistant Professor of Marketing, 1992.*
Rosen, William M., *Professor of Chemistry, 1982, 1970.*
Rosenbaum, Sarah, *Associate Professor of Pharmaceutics, 1991, 1987.*
Rossby, Hans Thomas, *Professor of Oceanography, 1975.*
Rossi, Joseph S., *Research Associate Professor of Psychology, 1990, 1985.*
Rothschild, H. Dorothy, *Professor of French, 1974, 1962.*
Rothstein, Lawrence, *Professor of Political Science, 1985, 1976.*
Rothstein, Lewis M., *Associate Professor of Oceanography, 1989.*
Roush, Susan E., *Assistant Professor of Physical Therapy, 1991.*
Rowinski, Mark J., *Director of Physical Therapy Program and Associate Professor of Physical Education, 1987.*
Roworth, Wendy W., *Professor of Art, 1988, 1976.*
Ruemmele, Bridget A., *Assistant Professor of Plant Sciences, 1991.*
Ruggiero, Laurie, *Assistant Professor of Psychology, 1992.*
Russo, Francis Xavier, *Professor of Education, 1973, 1966.*

Sadasiv, Angaraih Ganesan, *Professor of Electrical Engineering, 1976, 1969.*
Sadd, Martin H., *Professor of Mechanical Engineering and Applied Mechanics, 1984, 1979.*
Saladino, David, *Associate Professor of Music, 1993.*
Schaffran, Jerome A., *Associate Professor of Human Development and Family Studies, 1977, 1971.*
Schilling, Jean-Guy, *Professor of Oceanography, 1974, 1966.*
Schmidt, Charles T., Jr., *Professor of Industrial Relations, 1973, 1968.*
Schmieding, Norma Jean, *Professor of Nursing, 1993, 1990.*
Scholl, Richard W., *Professor of Management, 1990, 1979.*
Schoonover, Eric Thomas, *Associate Professor of English, 1980, 1962.*
Schroeder, Karen A., *Assistant Professor of Human Development and Family Studies and of Women's Studies, 1972, 1968.*
Schultz, Beatrice, *Professor of Communication Studies, 1990, 1981.*
Schwartz-Barcott, Donna, R.N., *Professor of Nursing, 1992, 1975.*
Schwarz, Stephen D., *Professor of Philosophy, 1979, 1963.*
Schwarzbach, Henry R., *Professor of Accounting, 1988, 1976.*
Schwegler, Robert A., *Professor of English, 1991, 1978.*
Seigel, Jules P., *Professor of English, 1976, 1965.*
Seleen, Diane Rae, *Associate Professor of Physical Education and Women's Studies, 1982, 1971.*
Shaikh, Zahir A., *Professor of Pharmacology and Toxicology, 1986, 1982.*
Shamoon, Linda Kaplan, *Associate Professor of English, 1987, 1967.*
Shao, David M., *Associate Professor of Industrial Engineering, 1976, 1969.*
Sharif, Mohammed, *Associate Professor of Economics, 1990, 1984.*
Shaw, Richard J., *Associate Professor of Plant Sciences, 1976, 1970.*
Shea, Gail Anne, *Assistant Professor of Sociology and Anthropology and Women's Studies, 1975.*
Shimizu, Yuzuru, *Professor of Pharmacognosy and of Chemistry, 1977, 1969.*
Shisha, Oved, *Professor of Mathematics, 1976, 1974.*
Shoop, C. Robert, *Professor of Zoology, 1974, 1969.*
Shugar, Dana R., *Assistant Professor of English and Women's Studies, 1991.*
Shukla, Arun, *Professor of Mechanical Engineering and Applied Mechanics, 1988, 1981.*
Sigurdsson, Haraldur, *Professor of Oceanography, 1980, 1974.*
Siitonen, Leena, *Associate Professor of Library and Information Studies, 1990, 1987.*
Sillanpoa, Wallace P., *Associate Professor of Italian, 1989, 1983.*
Silva, Armand J., *Professor of Ocean and Civil Engineering, 1976.*
Silverstein, Albert, *Professor of Psychology, 1974, 1963.*
Simpson, Kenneth L., *Professor of Food Science and Nutrition, 1972, 1964.*
Sine, Robert C., *Professor of Mathematics, 1977, 1971.*
Singer, Jay, *Associate Professor of Communicative Disorders, 1983, 1977.*
Sink, Clay V., *Professor of Management, 1982, 1969.*
Smayda, Theodore John, *Professor of Oceanography and Botany, 1970, 1959.*
Smith, Nelson F., *Professor of Psychology, 1975, 1965.*
Sodhi, Manbir S., *Assistant Professor of Industrial and Manufacturing Engineering, 1991.*
Sonstroem, Robert J., *Professor of Physical Education and Health, 1980, 1969.*
Spaulding, Malcolm L., *Professor of Ocean Engineering, 1983, 1973.*
Specker, Jennifer L., *Professor of Zoology, 1993, 1984.*
Spence, John E., *Professor of Electrical Engineering, 1974, 1962.*
Sperry, Jay F., *Associate Professor of Biochemistry, Microbiology, and Molecular Genetics, 1983, 1977.*
Starkey, James L., *Professor of Economics, 1992, 1967.*
Stein, Arthur, *Professor of Political Science, 1974, 1965.*
Stein, Karen F., *Professor of English and Women's Studies, 1992, 1968.*
Stepanishen, Peter R., *Professor of Ocean Engineering, 1982, 1974.*
Stevenson, John F., *Professor of Psychology, 1989, 1973.*
Steyerl, Albert, *Professor of Physics, 1987.*
Strom, Sharon Hartman, *Professor of History and Women's Studies, 1982, 1969.*
Strommer, Diane W., *Dean of University College and Special Academic Programs and Adjunct Professor of English, 1980.*
Sullivan, Richard E., *Associate Professor of Education, 1988, 1971.*
Sullivan, William Michael, *Associate Professor of Plant Sciences, 1987, 1981.*
Sun, Ying, *Associate Professor of Electrical Engineering, 1990, 1985.*
Sunak, Harish R.B., *Professor of Electrical Engineering, 1991, 1985.*
Surprenant, Carol F., *Associate Professor of Marketing, 1988.*
Suryanarayan, E. Ramnath, *Professor of Mathematics, 1973, 1960.*
Sutinen, Jon G., *Professor of Resource Economics, 1988, 1973.*
Suzawa, Gilbert S., *Associate Professor of Economics, 1981, 1971.*
Swallow, Stephen K., *Associate Professor of Resource Economics, 1994, 1988.*
Swan, M. Beverly, *Provost and Vice President for Academic Affairs and Associate Professor of English, 1981, 1974.*
Swaszek, Peter F., *Associate Professor of Electrical Engineering, 1987, 1984.*
Swift, Elijah, *Professor of Oceanography and Botany, 1980, 1969.*
Swift, Judith M., *Professor of Theatre, 1986, 1971.*
Swonger, Alvin K., *Professor of Pharmacology and Toxicology, 1985, 1971.*
Taggart, David G., *Assistant Professor of Mechanical Engineering and Applied Mechanics, 1989.*
Taubman, Albert H., *Professor of Pharmacy Administration, 1986, 1982.*
Thiem, Leon T., *Associate Professor of Civil and Environmental Engineering, 1989, 1983.*
Thurston, Gary, *Professor of History, 1984, 1966.*
Toloudis, Constantin, *Associate Professor of French, 1977, 1966.*
Traficante, Daniel D., *Professor of Chemistry, 1991.*
Traxler, Richard W., *Professor of Food Science and Nutrition and of Biochemistry, Microbiology, and Molecular Genetics, 1971.*
Tremblay, George C., *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1975, 1966.*
Trivelli, Remo J., *Professor of Italian, 1984, 1969.*
Trostle, Susan L., *Associate Professor of Education, 1990, 1985.*
Trubiano, Mario F., *Associate Professor of Spanish, 1984, 1979.*
Tryon, Jonathan Stedman, *Professor of Library and Information Studies, 1994, 1969.*
Tsiatas, George, *Associate Professor of Civil and Environmental Engineering, 1991, 1988.*
Tufts, Donald W., *Professor of Electrical Engineering, 1967.*
Turnbaugh, William A., *Professor of Anthropology, 1983, 1974.*
Tutt, Ralph M., *Professor of English, 1992, 1964.*
Twombly, Saran, *Associate Professor of Zoology, 1993, 1987.*
Twomey, John G., *Assistant Professor of Nursing, 1992.*
Tyce, Robert C., *Professor of Ocean Engineering and Oceanography, 1992, 1983.*
Tyler, Gerry Ruth Sack, *Professor of Political Science, 1993, 1966.*
Tyrrell, Timothy J., *Professor of Resource Economics, 1994, 1978.*
Uht, Agustus K., *Assistant Professor of Electrical and Computer Engineering, 1992.*
Urish, Daniel W., *Professor of Civil Engineering, 1991, 1978.*
Vaccaro, Richard J., *Professor of Electrical Engineering, 1993, 1983.*
Valdez, Alora J., *Assistant Professor of Education, 1992.*
Valentino, Dominic, *Professor of Psychology, 1991, 1973.*
Vangermeersch, Richard, *Professor of Accounting, 1979, 1971.*
Vaughn, Sue Fisher, *Assistant Professor of English, 1972, 1966.*
Veeger, Anne, *Assistant Professor of Geology, 1991, 1989.*
Velicer, Wayne F., *Professor of Psychology, 1982, 1973.*
Venkatesan, M., *Professor of Marketing, 1988.*
Verma, Ghasi Ram, *Professor of Mathematics, 1980, 1964.*
Veyera, George E., *Associate Professor of Civil and Environmental Engineering, 1992, 1988.*
Viglionese, Paschal, *Professor of Italian, 1988, 1964.*
Vittimberga, Bruno M., *Professor of Chemistry, 1971, 1961.*
Walton, Jean, *Assistant Professor of English, 1993.*
Watts, D. Randolph, *Professor of Oceanography, 1988, 1974.*
Weaver, Thomas F., *Professor of Resource Economics, 1992, 1971.*
Weisbord, Robert G., *Professor of History, 1973, 1966.*
Welters, Linda M., *Professor of Textiles, Fashion Merchandising, and Design, 1994, 1981.*
Wenisch, Fritz, *Professor of Philosophy, 1980, 1971.*
Wessells, Cathy R., *Assistant Professor of Resource Economics, 1989.*
West, Niels, *Professor of Marine Affairs, 1988, 1976.*
Westin, Stuart A., *Associate Professor of Management Science, 1989, 1983.*
Wheelock, Kimber, *Associate Professor of Theatre, 1976, 1965.*
White, Clement A., *Associate Professor of Languages, 1994, 1988.*
White, Frank Mangrem, *Professor of Mechanical and Ocean Engineering, 1967, 1964.*
Whitworth, Ulysses G., *Assistant Professor of Fisheries, 1992.*

Wichelns, Dennis G., *Associate Professor of Resource Economics, 1992, 1986.*
Willey Lessne, Cynthia, *Assistant Professor of Pharmacy Administration, 1992, 1987.*
Willis, George H., *Professor of Education, 1981, 1971.*
Willis, W. Grant. *Associate Professor of Psychology, 1990, 1987.*
Willoughby, Alan, *Professor of Psychology, 1974, 1968.*
Wilson, Mason P., Jr., *Professor of Mechanical Engineering and Applied Mechanics, 1976, 1968.*
Wimbush, Mark, *Professor of Oceanography, 1990, 1977.*
Winn, Howard Elliott, *Professor of Oceanography and Zoology, 1965.*
Wishner, Karen, *Professor of Oceanography, 1993, 1980.*
Wolfe, Victor, *Assistant Professor of Computer Science and Statistics, 1991.*
Wolke, Richard E., *Professor of Fisheries, Animal and Veterinary Science, 1981, 1970.*
Wood, Norris P., *Professor of Biochemistry, Microbiology, and Molecular Genetics, 1972, 1963.*
Wright, Raymond M., *Professor of Civil and Environmental Engineering, 1993, 1981.*
Wright, William Ray, *Professor of Natural Resources Science, 1987, 1972.*
Xiao, Jingjian, *Assistant Professor of Human Development and Family Studies, 1992.*
Yang, Qing, *Associate Professor of Electrical Engineering, 1993, 1988.*
Yang, Sze Cheng, *Professor of Chemistry, 1990, 1980.*
Yeaw, Evelyn, R.N., *Associate Professor of Nursing, 1993, 1985.*
Yoder, James A., *Associate Dean of the Graduate School of Oceanography and Professor of Oceanography, 1992, 1989.*
Young, Betty, *Assistant Professor of Education, 1989.*
Zeyl, Donald J., *Professor of Philosophy, 1984, 1971.*
Zhang, Zongqin, *Assistant Professor of Mechanical Engineering, 1991.*
Zia, Hossein, *Associate Professor of Pharmaceutics, 1992, 1986.*
Zipkowitz, Fay, *Associate Professor of Library and Information Studies, 1987.*
Zoski, Cynthia G., *Assistant Professor of Chemistry, 1989.*
Zucker, Norman L., *Professor of Political Science, 1969, 1966.*

Adjunct Faculty

Abrams, David B., *Adjunct Professor of Psychology, 1986.*
Apostal, Michael C., *Adjunct Associate Professor of Civil and Environmental Engineering, 1978.*
Arnold, Charles R., *Adjunct Associate Professor of Computer Science, 1981.*
Arthur, Michael A., *Adjunct Professor of Oceanography, 1991.*
Badorek, Diane L., *Adjunct Assistant Professor of Civil and Environmental Engineering, 1985.*
Baksi, Sandra M., *Adjunct Assistant Professor of Pharmacology and Toxicology, 1994.*
Balkovic, Edward, *Adjunct Assistant Professor of Clinical Laboratory Science, 1990.*
Banerjee, Pranab K., *Adjunct Professor of Electrical Engineering, 1980.*
Barker, Barbara E., *Adjunct Associate Professor of Clinical Laboratory Science, 1988.*
Barrach, Hans-Jurgen, *Adjunct Associate Professor of Pharmacology and Toxicology, 1990.*
Berlinsky, David, *Adjunct Assistant Professor of Fisheries, Animal and Veterinary Science, 1993.*
Berner, Paul J., *Adjunct Professor of Chemistry, 1987.*
Bernon, Douglas B., *Adjunct Associate Professor of Psychology, 1992.*
Bleich, Vernon C., *Adjunct Assistant Professor of Natural Resources Science, 1992.*
Bodammer, Joel E., *Adjunct Associate Professor of Fisheries, Animal and Veterinary Science, 1990.*
Boekelheide, Kim, *Adjunct Associate Professor of Pharmacology and Toxicology, 1992.*
Bozyan, Elizabeth Pike, *Adjunct Assistant Professor of Physics, 1993.*
Bryant, Elizabeth Burke, *Adjunct Assistant Professor of Community Planning, 1992.*
Buckley, Lawrence J., *Adjunct Professor of Oceanography, 1991.*
Buckley, P.A., *Adjunct Professor of Oceanography and National Park Service Research Professor of Ecology, 1990.*
Buka, Stephen L., *Adjunct Assistant Professor of Psychology, 1992.*
Busalacchi, Antonio J., Jr., *Adjunct Professor of Oceanography, 1994.*
Canick, Jacob A., *Adjunct Associate Professor of Clinical Laboratory Science, 1988.*
Capasso, Joseph M., *Adjunct Associate Professor of Pharmacology and Toxicology, 1993.*
Chen, Dake, *Adjunct Professor of Oceanography, 1993.*
Chomet, Paul S., *Adjunct Professor of Botany, 1993.*
Colby, John J., *Adjunct Professor of Psychology, 1986.*
Crisman, Everett E., *Adjunct Assistant Professor of Chemical Engineering, 1989.*
Cuomo, Frank W., *Adjunct Professor of Physics, 1987.*
Dellaporta, Stephen, *Adjunct Assistant Professor of Plant Sciences, 1985.*
Detrick, Robert S., Jr., *Adjunct Professor of Oceanography, 1992.*
DeZolt, Denise, *Adjunct Assistant Professor of Psychology, 1993.*
Doering, Peter H., *Adjunct Professor of Oceanography, 1993.*
Donaghay, Percy I., *Adjunct Professor of Oceanography, 1991.*
Drozda, Edward A., Jr., *Adjunct Assistant Professor of Clinical Laboratory Science, 1990.*
Duce, Robert A., *Adjunct Professor of Oceanography, 1991.*
Erickson, Bette LaSere, *Adjunct Assistant Professor of Psychology, 1981.*
Fava, Joseph, *Adjunct Assistant Professor of Psychology, 1993.*
Fisher, Douglas O., *Adjunct Assistant Professor of Pharmacology and Toxicology, 1986.*
Fleming, Michael W., *Adjunct Associate Professor of Fisheries, Animal and Veterinary Science, 1993.*
Frenzel, E. Grace, *Adjunct Assistant Professor of Psychology, 1980.*
Gettman, Alan D., *Adjunct Assistant Professor of Entomology, 1992.*
Giambalvo, Cecilia T., *Adjunct Associate Professor of Pharmacology and Toxicology, 1979.*
Gifford, Dian J., *Adjunct Professor of Oceanography, 1992.*
Ginsberg, Howard S., *Adjunct Associate Professor of Plant Sciences, 1990.*
Goodman, Louis, *Adjunct Professor of Physics, 1989.*
Gorres, Josef H., *Adjunct Assistant Professor of Natural Resources Science, 1993.*
Groden, Gerald, *Adjunct Associate Professor of Psychology, 1981.*
Groden, June, *Adjunct Assistant Professor of Psychology, 1982.*
Groffman, Peter M., *Adjunct Associate Professor of Natural Resources Science, 1993.*
Gross, Laurence F., *Adjunct Professor of Textiles, Fashion Merchandising, and Design, 1988.*
Guilmette, Thomas J., *Adjunct Assistant Professor of Psychology, 1992.*
Hachadorian, Charles, Jr., *Adjunct Associate Professor of Pharmacy Practice, 1981.*
Haebler, Romona, *Adjunct Professor of Oceanography, 1991.*
Hammen-Winn, Susan L., *Adjunct Associate Professor of Botany, 1992.*
Hanson, Alfred K., Jr., *Adjunct Professor of Oceanography, 1993.*
Haspel, Katherine C., *Adjunct Assistant Professor of Psychology, 1985.*
Heelan, Judith S., *Adjunct Assistant Professor of Clinical Laboratory Science, 1988.*
Hilliard, Dennis C., *Adjunct Assistant Professor of Pharmacology and Toxicology and Acting Director of the State Crime Laboratory, 1992.*
Hubbell, Richard F., *Adjunct Assistant Professor of Mechanical Engineering and Applied Mechanics, 1990.*
Hudon, Paul, *Adjunct Professor of Textiles, Fashion Merchandising, and Design, 1988.*
Hudson, William E., *Adjunct Professor of Political Science, 1991.*
Hyde, Mark S., *Adjunct Professor of Political Science, 1991.*
Jackim, Eugene, *Adjunct Assistant Professor of Pharmacology and Toxicology, 1980.*
Josephson, Edward S., *Adjunct Professor of Food Science and Nutrition, 1986.*
Katz, Clifford H., *Adjunct Associate Professor of Zoology, 1991.*
Kausch, Albert P., *Adjunct Professor of Botany, 1993.*
Keating, J. Michael, *Adjunct Professor of Labor and Industrial Relations, 1987.*
Kennedy, Holly Powell, *Adjunct Assistant Professor of Nursing, 1993.*
Kenney, Margaret, *Adjunct Assistant Professor of Clinical Laboratory Science, 1988.*
Kimball, Marjorie G., *Adjunct Assistant Professor of Clinical Laboratory Science, 1988.*
Kiron, M.A. Ravi, *Adjunct Assistant Professor of Pharmacology and Toxicology, 1993.*
Kitsos, Thomas R., *Adjunct Professor of Marine Affairs, 1991.*
Klein-MacPhee, Grace, *Adjunct Associate Professor of Fisheries, Animal and Veterinary Science, 1989.*
Klyberg, Albert T., *Adjunct Associate Professor of History, 1976.*
Knott, J. Eugene, *Adjunct Associate Professor of Psychology and Human Development and Family Studies, 1975.*
Kohler, Nancy E., *Adjunct Professor of Oceanography, 1993.*
Kumekawa, Glenn, *Director of Intergovernmental Policy Analysis Program and Adjunct Associate Professor of Community Planning and Area Development, 1980.*
LaFazia, Leonard M., *Adjunct Assistant Professor of Clinical Laboratory Science, 1990.*
LaForge, Robert, *Adjunct Assistant Professor of Psychology, 1993.*
Lalor, Thomas M., *Adjunct Assistant Professor of Medicinal Chemistry, 1994.*

Larrat, Paul E., *Adjunct Assistant Professor of Pharmacy Practice and Director of Pharmacy Continuing Education Programs, 1992.*
Latimer, James S., *Adjunct Professor of Oceanography, 1992.*
Leazes, Francis J., *Adjunct Associate Professor of Political Science, 1991.*
Levinsky, Herbert V., *Adjunct Associate Professor of Pharmacology and Toxicology, 1988.*
Lewandowski, Anthony, *Adjunct Assistant Professor of Clinical Laboratory Science, 1988.*
Lubiner, Judith, *Adjunct Assistant Professor of Psychology, 1992.*
Malcolm, Alexander R., Jr., *Adjunct Assistant Professor of Oceanography, 1989, and Adjunct Professor of Pharmacology and Toxicology, 1991.*
Mather, Thomas, *Adjunct Assistant Professor of Zoology, 1988.*
Mayer, Kenneth H., *Adjunct Assistant Professor of Clinical Laboratory Science, 1988.*
McCorkle, Richard A., *Adjunct Professor of Physics, 1993.*
Meglio, Franklin, *Adjunct Assistant Professor of Clinical Laboratory Science, 1980.*
Messier, Richard H., *Adjunct Associate Professor of Mechanical Engineering and Applied Mechanics, 1977.*
Miller, Donald C., *Adjunct Professor of Zoology, 1975.*
Mitchell, Roger E., *Adjunct Associate Professor of Psychology, 1989.*
Monti, Peter, *Adjunct Associate Professor of Psychology, 1977.*
Motte, Mark, *Adjunct Assistant Professor of Community Planning, 1992.*
Naar, David F., *Adjunct Professor of Oceanography, 1992.*
Noone, Kevin J., *Adjunct Professor of Oceanography, 1993.*
Omar, Mostafa M.M., *Adjunct Assistant Professor of Pharmacognosy and Environmental Health Sciences, 1985.*
Opal, Steven M., *Adjunct Associate Professor of Clinical Laboratory Science, 1988.*
Parella, Mary A., *Adjunct Assistant Professor of Community Planning, 1992.*
Patton, Alexander J., *Adjunct Professor of Mechanical Engineering and Applied Mechanics, 1989.*
Pechenik, Jan A., *Adjunct Associate Professor of Fisheries, Animal and Veterinary Science, 1991.*
Pell, Claiborne D., *Adjunct Professor of Marine Affairs, 1982.*
Pesch, Gerald G., *Adjunct Professor of Oceanography, 1992.*
Phelps, Donald K., *Adjunct Professor of Oceanography, 1969.*
Plummer, Barry A., *Adjunct Assistant Professor of Psychology, 1991.*
Profughi, Victor L., *Adjunct Professor of Political Science, 1991.*
Pruell, Richard J., *Adjunct Professor of Oceanography, 1990.*
Ravenscroft, Robert A., Jr., *Adjunct Assistant Professor of Computer Science and Statistics, 1994.*
Reynolds, Charles C., *Adjunct Professor of Industrial Engineering, 1982.*
Roberts, Eric M., *Adjunct Assistant Professor of Botany and Plant Sciences, 1991.*
Rogers, Caroline S., *Adjunct Professor of Oceanography, 1994.*
Roman, Charles T., *Adjunct Professor of Oceanography, 1990.*
Rubin, Robert V., *Adjunct Assistant Professor of Computer Science, 1989.*
Schatz, Daniel J., *Adjunct Assistant Professor of Community Planning and Area Development, 1982.*
Sebelia, Linda, *Adjunct Associate Professor of Food Science and Nutrition, 1989.*
Seifert, Gerald, *Adjunct Professor of Marine Affairs, 1982.*
Seymour, Charles, *Adjunct Associate Professor of Clinical Laboratory Science, 1988.*
Shah, Navnit, *Adjunct Associate Professor of Pharmaceutics, 1993.*
Shaw, Robert B., *Adjunct Associate Professor of Community Planning and Area Development, 1982, and Adjunct Associate Professor of Civil and Environmental Engineering, 1985.*
Sheff, Michael, *Adjunct Professor of Clinical Laboratory Science, 1988.*
Shonting, David H., *Adjunct Professor of Ocean Engineering, 1987.*
Smith, Tim D., *Adjunct Professor of Oceanography, 1991.*
Sorensen, Jens C., *Adjunct Associate Professor of Marine Affairs, 1985.*
Stottmeier, Kurt D., *Adjunct Professor of Clinical Laboratory Science, 1988.*
Strauss, Charles M., *Adjunct Associate Professor of Computer Science, 1992.*
Sullivan, Barbara K., *Adjunct Professor of Oceanography, 1993.*
Taylor, Suzanne, *Adjunct Professor of Labor and Industrial Relations, 1987.*
Taylorson, Raymond B., *Adjunct Professor of Plant Sciences, 1990.*
Thomas, Carol J., *Adjunct Professor of Community Planning and Area Development, 1971.*
Thursby, Glen D., *Adjunct Associate Professor of Botany, 1987.*
Tucker, Wayne, *Adjunct Assistant Professor of Mechanical Engineering and Applied Mechanics, 1991.*
Turner, Jefferson T., *Adjunct Professor of Oceanography, 1994.*
Turner, Ruth D., *Adjunct Professor of Zoology, 1986.*
Uhlman, James S., *Adjunct Associate Professor of Ocean Engineering, 1993.*
Varna Garis, Ann, *Adjunct Assistant Professor of Psychology, 1994.*
Wallace, Mark C., *Adjunct Assistant Professor of Natural Resources Science, 1993.*
Williams, David O., *Adjunct Assistant Professor of Biomedical Engineering, 1977.*
Winsor, Davis S., *Adjunct Assistant Professor of Community Planning and Area Development, 1985.*
Wood, David H., *Adjunct Associate Professor of Mathematics, 1988.*
Wright, Thomas E., *Adjunct Professor of Civil and Environmental Engineering, 1983.*
Younkin, Burrows T., *Adjunct Professor of Clinical Laboratory Science, 1988.*

Clinical Appointments

Fimbel-Coppa, Denise, *Clinical Assistant Professor of Nursing, 1985.*
Winter, Vicki L., *Clinical Assistant Professor of Physical Therapy and Academic Coordinator of Clinical Education, 1992.*

Faculty Emeriti

Abell, Paul, Ph.D., *Professor of Chemistry*
Alexander, Lewis M., Ph.D., *Professor of Geography*
Beckman, Carl H., Ph.D., *Professor of Plant Sciences*
Bumpus, Marguerite J., Ed.D., *Professor of Education*
Chang, Pei Wen, Ph.D., *Professor of Fisheries, Animal and Veterinary Science*
Gersuny, Carl, Ph.D., *Professor of Sociology*
Greene, Helen Finch, Ph.D., *Associate Professor of Human Development, Counseling, and Family Studies*
Hanke, John W., Ph.D., *Professor of Philosophy*
Jeffries, Harry Perry, Ph.D., *Professor of Oceanography*
Jensen, Patricia, Ph.D., *Assistant Professor of Library and Information Studies*
Knauss, John A., Ph.D., *Dean of the Graduate School of Oceanography and Professor of Oceanography*
Malina, Marilyn J., Ph.D., *Associate Professor of English*
Merenda, Peter F., Ph.D., *Professor of Psychology*
Millar, Richard I., M.S., *Associate Professor of Fisheries, Animal and Veterinary Science*
Napora, Theodore, Ph.D., *Associate Professor of Oceanography*
Nash, Charles D., Ph.D., *Professor of Mechanical Engineering and Applied Mechanics*
Polk, Charles, Ph.D., *Professor of Electrical Engineering*
Potter, Nancy A., Ph.D., *Professor of English*
Rayack, Elton, Ph.D., *Professor of Economics*
Roxin, Emilio O., Ph.D., *Professor of Mathematics*
Saila, Saul B., Ph.D., *Professor of Oceanography and Zoology*
Schwartzman, Solomon, Ph.D., *Professor of Mathematics*
Sieburth, John M., Ph.D., *Professor of Oceanography*
Silvestri, Gino, Ph.D., *Assistant Professor of History*
Steeves, Edna L., Ph.D., *Professor of English*
Vosburgh, William T., Ph.D., *Professor of Psychology*
Young, William, Th.D., *Professor of Philosophy*

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